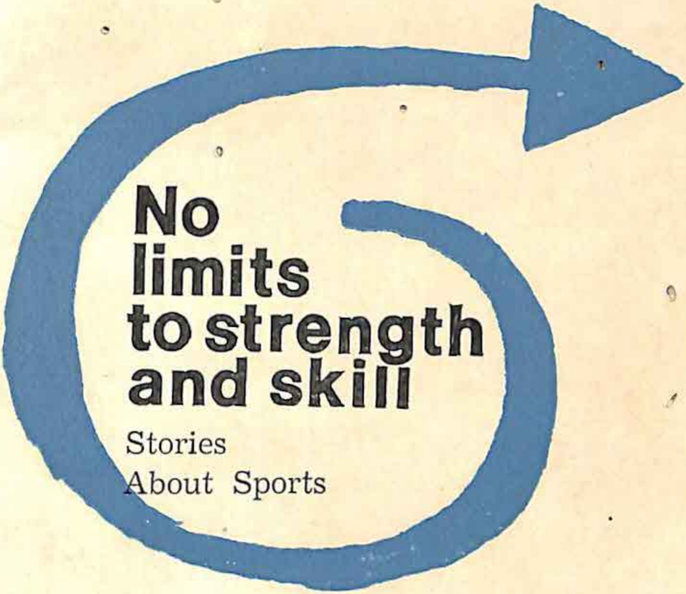
LEARNING PEOPLE AND THINGS

NO LIMITS TO STRENGTH AND SKILL

ALEXANDER SVETOV

SLM, 187



No limits to strength and skill

Stories About Sports

NOVOSTI
PRESS AGENCY
PUBLISHING HOUSE

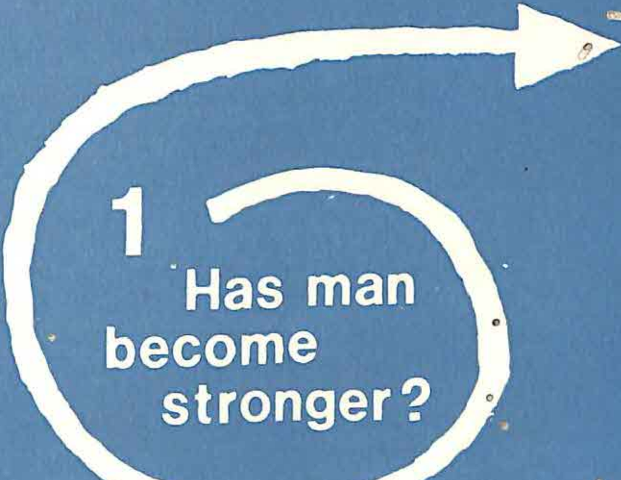
CONTENTS

Has Man Become Stronger? 5
Legend and Fact 7
Some Comparisons 14
Once a Record—Now Child's Play 19
Who Said—"Weak Sex"? 20

Where Millions Go In For Sports 25
The Day Begins with Exercises 27
Old Age Retreats 31
Tens of Millions on the Start 33
Talented Individuals? No. A Gifted Group! 38

Key to the Magic Box 41
How Science Helps Sports 43
The Magic Pill and Professor Hill 47
Action for Strength 49
What's the Secret? 50
Be a Fan—It's Good for You 53
Physics and Sports 54
Silver Track 57
Secret of Japanese Serve 61
Artificial Snow and Synthetic Skis 64
Polyethylene Spikes 67
The Fibreglass Pole and Its Forefathers 69
Are All Innovations Good? 73
Confirmed by the Olympiad 77

People of the future 83
Miracles without Miracles 85
Psychological Barriers 87
Athletes' Coefficient of Efficiency 88
Champions of the XXI Century 90
Beauty—Real and False 98
Why We are Against the "Body-Building" Fad 102
What will Man be Like? 106
Sports and Space 111
Talking it Over with the Reader 114



1

Has man become stronger?

Legend and Fact

Man today can do almost anything. In about an hour he can girdle the Earth in a space ship, he can lift hundreds of tons with his finger using a crane, turn rivers back, create seas and plough more land a day than reaches to the horizon.

But strip man of this and what is he like? What is man like without all the magic pluses of the century, without the achievements of science and engineering? Does he have strength in his muscles and speed in his legs? Is he more agile than his forefathers? Is his endurance greater?

Many believe that man was much stronger in days gone by. Necessity made him use his feet to get places. He eked out a livelihood in hard physical labour. Fishing and hunting demanded agility and endurance. Man was not softened by modern comforts.

There are legends and tales about the colossal strength of our forefathers. There are also historical facts that have come down to us. There isn't a nationality on Earth that did not have its strongmen in the past—both real and fictitious.

In Russia, for instance, the strongest knight of all was Ilya Muromets, son of a peasant. His strength was fabulous. In clearing out a forest he would down an old oak with one stroke of his axe or would uproot a young one with his bare hands.

In old Russian annals and memoirs we read much about the tremendous strength and skill of real living beings. One of these men of outstanding strength was Tsar Peter the Great. He was tall and strong of body.

One of the stories about Tsar Peter tells us how once he was riding when suddenly his steed lost its shoe. Peter stopped at the first village smithy.

Peter was accompanied by several soldiers of the Preobrazhenski Regiment. He was dressed the same way his companions were and the smithy did not recognise him. He took him for a soldier.

The smithy got his fire going, reached for a horseshoe, raised the steed's leg and was about to begin work when Peter stopped him.

"Let me see that shoe, smithy."

"No, that won't do!" He took the shoe in his hands and broke it in two.

The smithy was surprised by the strength of this "soldier" but said nothing. He reached for another shoe, a thicker one this time. Peter broke this one too.

The blacksmith made a new horseshoe, so strong this time, that no matter how hard Peter tried he could not break it.

"This is the real thing," he said approvingly.

When the job was done Peter tossed the smithy a copper 5 kopeck coin. But now it was the turn of the Tsar to be astounded. The blacksmith placed the coin between his fingers and with one effort broke it in half.

"This coin is no good," he said.

Peter then gave him a silver rouble, but the smithy broke it just as easily.

"This too is no good!"

Full of admiration at the smithy's strength, Peter took out a gold piece.

"Now that's the real thing!" said the smithy laughing as he took the coin.

Another man of astounding strength was Captain Lukin, a Russian naval officer, who lived in the first half of the last century. He could push a nail into a board with one finger and hold heavy anchors in outstretched hands.

During the Grimean War which Britain, Turkey and France started against Russia in 1854 an ordinary Russian seaman by the name of Fyodor Koshka, a hero of the defence of Sevastopol, won renown for his strength and daring. During lulls in the fighting he would amuse his mates by juggling cannon balls. He would throw them up like rubber balls and catch them with outstretched hands.

In besieged Sevastopol a young artillery officer attracted general attention. He would drag heavy artillery pieces from one firing position to another under enemy shelling. While doing it he would encourage his men with jokes and merry sayings. When the shooting stopped the officer would exercise with a bar. Only this was an unusual bar. It was a long artillery rod and at each end hung two soldiers. The officer held it up and spinned it around with the men hanging on. The whole world knows this officer–that was the writer Count Leo Tolstoi.

The great Azerbaijanian poet, Nizami, lauds the strength and skill of Man in his poem—"The Seven Beauties". But above all he treasured intellect and training. The heroine of the poem, the slave Fitneh, set out to prove to the Crown Prince Bekhrem what tremendous strength training can develop in a man. She lifted a calf every day until it grew up into a bull. And then she carried the bull to the top of a high tower.

Naturally, this legend, as all others, stretches the point somewhat. There is hardly a strongman who could repeat the feat of the beautiful Fitneh. Still there are many men who did become unusually strong through daily exercise.

Not far from Baku is the tiny village of Mashtagi. Many famous wrestlers came from here. The fame of the local strongman, the peasant, Alti Ailikh, who lived in the last century, spread throughout Azerbaijan. Even now there are old folk who remember him. They say that he used to carry a baby camel on his back all the time to develop strength.

Alti Ailikh worked out a whole system of exercises with Indian clubs weighing more than 50 kilograms and big wooden shields. Some of them are still on display at the Azerbaijanian Historical Museum.

In 1710 there was a strong man in England named Thomas Tougham. He would stand on an elevated platform and lift three barrels weighing 800 kilograms by a belt thrown around his neck.

Then there was the street athlete Rolland the Toothless, who travelled through France and Belgium at the end of the last century showing surprising feats of strength. He would put four iron weights totalling 80 kilograms on a horse, an iron axle weighing another 73 and seated his wife in the saddle after which he would get under the horse and raise it with all it was carrying.

One gets to realise the impact of things by comparison. But with what are we to compare the strength, skill, stamina and finally the moral traits of a man? Of the daring man we can say he is as brave as a lion, of the strongman—he is as strong as a bull. Of the fleetfooted—he is as fast as a hare. Yet statistics tell us that none of these animals mentioned can measure up to man in strength, speed or bravery.

At the end of the last century there was a Russian strongman—Sandov—appearing in the circus arena. He wrestled with an African lion. True, before turning the lion loose in the arena they muzzled it and put leather gloves on its paws so that it would not injure the athlete. And the man came out the winner.

In the town of Gorki there lives a former circus wrestler, Nikolai Turbas, now on pension. In his youth he had quite a few breath-taking acts. With one finger he raised three full grown men bound together by a towel, he made a "necktie" out of iron rods and broke horseshoes with his hands. But his most difficult and dangerous act was his bout with a bull. Six attendants would drag a huge bull out on the arena and Turbas would approach it with a red cape in his hands. The maddened animal charged. Turbas skilfully stepped aside and seized the bull by the horns. What strength and courage one must have to overcome a frenzied bull! And the man came out victorious—he killed the bull with his bare hands.

These examples mainly involve professional circus strongmen since in the old days there was virtually no amateur sport and the athletes could only display their strength in the circus or market places. The public was attracted by the posters and came en masse. A particular attraction were the wrestling championships. In order to net greater income the owners of circuses and sponsors of these bouts dragged out the championships for several weeks and even months.

Circus wrestling in Russia was particularly widespread at the end of the last and beginning of this century. The circus athletes would often "fix" the bouts. Of course, such championships had nothing in common with sports.

However, there were very strong and honest men among the professionals. They fought honestly relying only on their strength and skill. Of particular renown among them were Ivan Poddubny and Ivan Zaikin. These strongmen did much to win glory for Russian sport.

From his childhood Ivan Poddubny did backbreaking peasant jobs at his father's farm. In his youth he went to the port of Sevastopol to work as a docker. This tall, husky youth attracted everyone's attention with his strength and ability. The dockers and seamen were so impressed by his strength and imposing appearance that they nicknamed him Ivan the Great.

Manual labour added strength to Poddubny but he wanted to become still stronger. He began doing gymnastics and athletic exercises daily. They took him on at the circus and at the very first championship the docker-strongman beat all his opponents.

Poddubny toured many cities and countries. He met and beat the strongest professionals in the world.

In 1905 at the world championship in Paris which brought together 140 of the strongest wrestlers Poddubny won the professional title. After this he took part in five more world championships and placed first all five times. This made him the most famous wrestler in the world, the "champion of champions".

More than half a century ago another Russian strongman—the Volga docker—Ivan Zaikin, also won fame for his tremendous strength. He began his wrestling career on the boards of travelling fairs. He beat many renowned wrestlers of the time. The only one he could not pin down was Poddubny.

Zaikin was born in 1880 into a peasant's family in the village of Upper Talyzino, Simbirsk province. He joined Dumont's travelling circus where he appeared in strongman acts. From the very start of his circus career he steered clear of tricks that fooled the public. He showed what he really possessed—strength and ability.

In one of his acts ten men carried out an anchor weighing half a ton. Anyone could come to see that this was the real thing. Zaikin lifted the anchor on his shoulders and without bowing under its weight walked around the arena. Then with a slight movement of his shoulder the strongman dislodged the anchor which fell with a bang like thunder to the boards below.

Zaikin liked to exercise with weights and to wrestle. At that time French, or as it is now called—Greco-Roman wrestling, was just beginning to catch on. Ordinarily wrestlers gripped each other's belts.

While at the circus Zaikin rapidly mastered belt and Greco-Roman wrestling. No major championship took place without his participation.

At the international wrestling championship in Paris in 1908 Zaikin placed second. The winner, as always, was Poddubny. In subsequent championships in which Poddubny did not take part Ivan Zaikin twice won the world professional wrestling title.

Ivan Zaikin died in 1949 in Kishinev. He was just under 70. One of the museums still has proof of his unusual strength—iron chains that he tore with his hands, and "bracelets" and "neckties" that he wove out of strip iron.

Some Comparisons

After reading these pages the reader might be induced to conclude that people used to be stronger than they are now and that at the dawn of human

development the Earth was populated by beings who possessed fabulous strength.

Twenty years ago an event took place that might have been thought to confirm this supposition. In Southeast Asia the skeleton was found of a man-like being of gigantic height and obviously unsurpassable strength. This being which the scientists called gigantopithecanthropus lived half a million years ago and according to the hypothesis of an American professor of German descent, Franz Weidenreich, was a distant ancestor of modern man. According to this hypothesis the gigantopithecanthropus gradually lost his former strength and turned into the modern man.

On the basis of this find certain scientists in the West tried to disprove Darwin's theory. They claimed this indicated that man did not develop evolutionally from lower forms to higher forms, but on the contrary that man degraded.

Later finds, however, upset Weidenreich's hypothesis as could have been expected. The gigantopithecanthropus turned out to be a variety of ape. They became extinct because their tremendous size prevented them from adjusting themselves to existing conditions.

There is a saying: Times change and with them we too—for the better. There is great truth to this and it is confirmed in everyday life: in facts and events that might seem to be insignificant at first sight.

Recently for the nth time I visited the Armoury in the Moscow Kremlin. Viewing the collection of relics dating back to old Russia I lingered in the hall which displayed weapons and armour of medieval times. There were flintlock guns, swords of damask steel, iron helmets and breast plates darkened with time. I had seen them time and again in the museum. But this time I looked at them from a different point of view. I tried to visualise the soldiers who used them. Undoubtedly the knights who used them were strong and brave. I involuntarily shifted my gaze to those standing alongside me. They were excursionists from Siberia and the virgin lands territory–tanned by the sun. There were tractor drivers and harvester combine operators with weather-beaten faces–they were a tall, broad-shouldered lot. I realised that not every suit of armour would fit them.

It seems I am not the only one interested in such a comparison.

In the London Tower there is a display of the armour worn by medieval knights. Visitors view them with great interest but it did not occur to anyone to try on a coat of mail or a helmet. Finally one scientist did think of this. He decided to ask several visitors at random to try on the armour. This would answer the question: was man better built physically in Robin Hood's day or today?

On this particular day every male viewing the display was asked to remove his jacket and to try on a helmet and coat of armour. There were all sorts of people—young and old. It appeared that the armour was small on them. It turned out that modern man is taller and more broad-shouldered than the bold knights who lived in days of yore.

This is confirmed by statistics. In 1889 the Russian scientist, D. N. Anuchin, found that the average height of the male Muscovite was 165 centimetres. Has the Muscovite grown in the past 75 years? Recently Moscow University's Research Institute carried out a survey at the city's factories and offices. It appears that the average male in Moscow is now 168 centimetres. That is an increase of 3 centimetres.

Interesting statistics were received from a survey of Moscow's boys. During the past half century the height of 3-year old children increased 15.5 cm on the average, 5-year olds—7.9 cm and the weight increase was 2.3 and 1.9 kilograms, respectively.

And so, people have become taller and heavier. Yet greater height, weight and even width of shoulders do not necessarily mean that man has become stronger. Nowadays strength is convincingly demonstrated at athletic tournaments. Sports is a wonderful way of ascertaining the moral and physical strength of the individual. In the excitement of athletic competition and the striving to win man can show exceptionally high results that would be inconceivable in ordinary circumstances.

Let us look at athletic records not as a mathematical expression of definite results attained by the athlete but as a measure of his physical potentialities. This will help us to compare the strongest men in the past with our contemporaries.

We have no information about the records of the Olympic Games in ancient days. We can only assume, indirectly, that long jumps in ancient Greece did not exceed 5.5 metres. Compare that with the record jump of the Soviet athlete Igor Ter-Ovanesyan–8 m 31 cm!

But let us turn to examples that will enable us to compare strength of athletes who lived not centuries ago but only a few decades before our time.

Weightlifting can measure the strength of man with precision. The rivals do not even have to meet. Weightlifters the world over lift bars and bells in a strictly designated manner. That places them in equal conditions and the fight for the record can be waged with contestants in different places.

In these contests man displays his real physical strength. The weightlifters are called the world's strongest strongmen. Who of them is the strongest?

A quarter of a century ago the world record for the jerk in the heavyweight division was a mere 140 kilograms. The record was repeatedly improved until it reached 197.5 kg. This is the record set by the American lifter, Paul Anderson, who was called the miracle-man. Yet the cheers had hardly subsided when the Soviet lifter, Yuri Vlasov, broke all of Anderson's records and won the gold medal at the 17th Olympic Games. He followed this by winning the world crown as well. Vlasov's total for the 3 Olympic lifts was 550 kilograms. His jerk was 211 kg. This is when people began calling him the strongest man on earth.

At the world championship in Stockholm in 1963 Yuri Vlasov again showed that his phenomenal records are not the limit of human possibilities. His three lifts total went up to 557.5 and his jerk showing to 212.5 kg.

At the time another Soviet strongman, Leonid Zhabotinsky, was not far behind Vlasov. He totalled 537.5 kg.

In the spring of 1964 Soviet weightlifters held another major tournament. There were record performances this time as well. The sensation of the meeting was produced by Leonid Zhabotinsky, the strongman from Zaporozhye.

The first exercise, the press, did not bring him success. He lifted only 180 kilograms. His snatch, however, set a new world record—168.5 kg. Then Zhabotinsky easily jerked 202.5 kg and asked the officials to boost the weight to 213 kg for his next try. This was 0.5 kg better than Yuri Vlasov's phenomenal record. The stands immediately became silently electric. The assistants had difficulty in hauling the weight to the scales to be weighed. The officials made a careful check. All this dragged on for agonising seconds. The athlete walked up to the bar, lifted it chest high, then raised it over his head. That shattered two world records of Yuri Vlasov's simultaneously—for the jerk and the total for the 3 Olympic lifts. The new world record stood at 560 kilograms!

True, this record was very short-lived. Three months later, in June 1964, Yuri Vlasov ran the total up to 562.5 kg to return the record. But the duel between Yuri Vlasov and Leonid Zhabotinsky is not yet over by far. The rivals themselves say as much.

In March 1964 Leonid Zhabotinsky told correspondents after he set his short-lived record: "The records reached are not the limit, of course, I am certain that this will be proved by Yuri Vlasov to begin with..."

Leonid Zhabotinsky was right. Here is what Yuri Vlasov said at the time. He could not take part in the tournament because of illness: "It's a pleasure to congratulate Leonid Zhabotinsky. I expected him to break my records. He's in excellent form. I believe that the weightlifter from Zaporozhye can lift a total of 570 kilograms. There's every reason to think he can do it..."

Once a Record—Now Child's Play

Many former Olympic records which, by the way, were also world records at first, are now bettered by schoolchildren. Here are several cases in point.

The swimming champion of the 1st Olympic Games in 1896 was a young Hungarian athlete Alfred Hajos. He swam 100 metres free style in 1 minute 22.2 seconds. Nowadays this result would not have earned him a 2nd grade rating in the Soviet Union and certainly not a place in the Olympic team.

In 1963 a Moscow boy, V. Alexeyev, placed first at the USSR School Games by swimming 100 metres free style in 1 minute 2 seconds. The girls' event was won by Tanya Zabrodina, a schoolgirl from Vorkuta. Her result was 1 minute 9 seconds. In other words even a schoolgirl could have beaten the male champion of the 1st Olympic Games.

Now a look at track and field.

The champion of the 1st Olympic Games Thomas Burke (USA) ran 100 metres in 12 seconds. At the time this was considered to be very fast. Now many youngsters in the Soviet Union run 100 metres in this time. The winners at the 8th USSR School Games, Sasha Lebedev, Yura Blinov and Valeri Pankratov all clocked the same time for 100 metres: 10.7 seconds. Olympic champion Burke would have been 20 metres behind these boys.

The 200-metre race was not included in the 1st Olympic Games. But at the II Olympics in 1900 the gold medal for 200 metres was won by Tucksbury (USA)—22.2 sec. Recently, a Byelorussian schoolboy, Valeri Pankratov, ran this distance at the School Games 1/10th of a second faster than the first Olympic champion did.

The high jump champion of the 1st Olympics Ellery Clark cleared 1 metre 81 centimetres. His long jump

result was 6 metres 35 centimetres. It is noteworthy that Valeri Brumel when 16 years old jumped much higher—1 metre 95 centimetres. Many Soviet boys and even girls jump higher and farther than the first Olympic champion did.

But, perhaps, the discus throwers were stronger in the past?

At the 1st Olympic Games an American student, Robert Garret, only managed to throw the discus 29 metres 15 centimetres.

Now the discus is not thrown as before from a height, but from a ring drawn on the ground. Throwing techniques have improved and with them—records. Suffice it to say that nowadays Olympic champion Robert Garret could only merit a second rating grade for boys in the Soviet Union for his record. First grade in the Soviet Union is 34 metres for boys.

There are just a few cases in events which can be measured in metres or seconds. However, it may be said in all certainty that in other sports as well our contemporaries are better than our forefathers.

Who Said— "Weaker Sex"?

So far we have only dealt with men's and boys' performances. What about women's records? Unfortunately, we cannot compare results shown by modern athletes with the records of the ancient Greeks. In ancient

times women were not permitted to the Olympic Games. They were not only forbidden to take part in the tournament but even to appear at the stadium.

The ancient Greeks believed that the presence of a woman at a tournament might bring bad luck.

There was, however, one case in the history of the ancient Olympic Games when a woman did appear at the stadium and was not executed. This woman was Pherenice. Her father, husband and brother were renowned athletes and Olympic winners. She wanted her son to continue the family tradition and win the laurel wreath too. She herself trained him for the boxing bouts. On the day her son was to appear Pherenice dressed in men's clothes and went to the stadium.

She was overjoyed when her son won. She jumped over the barrier separating the trainers' area from the arena to embrace him. Death was the sentence for this violation. But the stern judges did not dare pass the death sentence on a woman from such a famous family. She was pardoned but in order to prevent women in future from dressing in men's clothing and entering the stadium a rule was introduced that the trainers, just as the athletes, were to appear nude at the stadium.

Millennia passed. On the threshold of the 20th century when the Olympic Games were revived the sponsors introduced the ancient discriminatory ruling against women. Women could not compete in any

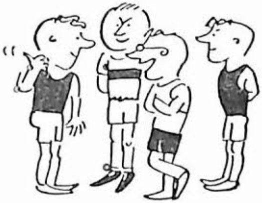
events although they could be present in the stands. Consequently the first Olympiads were all-male affairs. Only in 1912 an exception was made allowing women to compete in swimming. In 1928 women were eligible for gymnastics and certain track and field events. From Olympiad to Olympiad the women showed more and more convincingly that they too were capable of brilliant victories and could rightfully occupy a place of honour on the victors' stand together with the men.

In 1964 at the IX Winter Olympics the Soviet ice skater, Lydia Skoblikova, established a record of her own: she added to the two gold medals she won at the previous Games another four.

Compare the women's records at the XVII Olympic Games in Rome (1960) with the records of the men winners at the 1st Olympiad. The first Olympic record in the 100-metre race was 12 seconds and belonged to Burke (USA). At the Games in Rome his fellow country-woman Wilma Rudolph covered this distance a whole second faster.

The 800-metre race at the 1st Olympiad was won by Fleck (Australia) in 2 min. 11 sec. The champion at the Rome Games, Lyudmila Shevtsova (Soviet Union) covered this distance in 2 min. 4.3 sec.

Take the high jump record at the 1st Games set by Clark. His jump of 1 metre 81 centimetres was

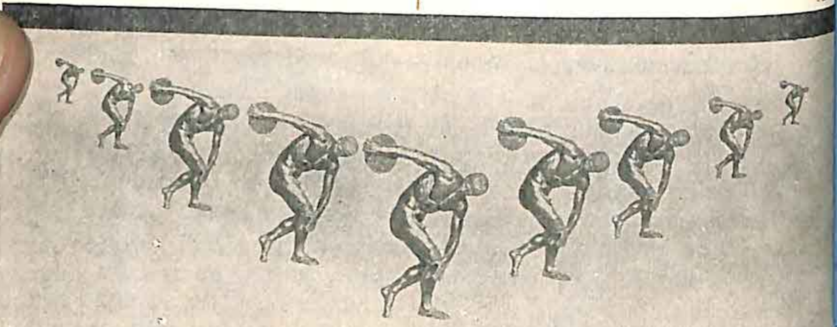


passed by the Rumanian athlete Iolanda Balas. She holds the European and World records with a jump of 1 metre 91 cm.

It is noteworthy that when women first began competing in Olympic swimming in 1912 they started with the result that the Hungarian champion Hajos chalked up at the 1st Olympiad—1 min. 22.2 sec. In Rome Miss Frazer (Australia) clocked the excellent time of 1 min. 1.2 sec.

This is not all the "weaker sex" are capable of in sports.

To round out—our contemporaries are way ahead of our forefathers in strength, skill and endurance.



2

Where millions go in for sports

The Day Begins with Exercises

There is no limit to physical perfection. This not only applies to a small circle of athletes but to many millions of men and women.

Take the experience gained in physical education in the Soviet Union. All mass sports and physical fitness activities are encouraged in every way in the Soviet Union. Broader sections of the population are drawn into the physical culture movement, in particular the youth. The CPSU Programme speaks of the need for the harmonical development of man's physical and spiritual forces.

The system of physical education is based on getting as many people into sports as possible.

The day begins with morning exercises. An X-ray view of Soviet cities would reveal the following picture every morning: millions of people doing gymnastic exercises, some under the guidance of an instructor over the radio, and others following systems of their own. This resembles a gigantic sports ground. Setting up exercises are done in every home. It has become a habit, a need which can no longer be ignored.

Recently I visited the old Russian city of Ryazan. In the morning when the freshness of the night had not yet left the streets and squares the ring of alarm clocks woke me up. It could be heard from the windows of a tall house as though coming from a musicbox. Some alarms sounded melodious, like silver bells, others sounded angry and persistent—time to get up! ... Who were those alarms ringing for? Who are they

getting up so early? After 2–3 minutes of waiting the answer appeared itself.

A flock of boys and girls in doublets and trunks swarmed into the courtyard from all staircases. In a minute lined up in Indian file children ran around the building with springy sport step several times. Then they fell in for gymnastics in their playground.

At a distance adults were doing their exercises. It seems that this house in Pervomaiskaya Street was a trail-blazer when it comes to physical fitness activities. They have a children's sports club there where the growing generation goes in for gymnastics, acrobatics, wrestling and ball games.

There are many similar courtyards in Ryazan where the tenants equip playgrounds and go in collectively for morning gymnastics, tennis and other sports.

Mass sport and physical fitness activities which were formerly in the hands of sport clubs at factories and schools are now spreading more and more on a neighbourhood scale. There are athletes everywhere who gladly organise these activities for their neighbours–for the younger generation and old folk. These athletes conduct morning exercises with them, arrange ball games and tournaments for the neighbourhood. Many courtyards which are equipped with sports grounds and laid out with greenery become rest and recreation zones.

Sports help people establish good comradely relations with one another and take children away from

bad influences in the street. This is not merely a trend of the times, not merely the vogue, but a new form of public activity dictated by life itself. This movement is broadening and acquiring more forms thanks to the initiative and inventiveness of its participants.

In the winter of 1964 an unusual tournament was held in Gorki. The teams that took part included representatives of two and even three generations of one family. This was something in the nature of a family Olympiad that began in January and ended in March. It attracted great interest in the city. Hundreds of families took the start in the skiing contests. The winners were the Suntsov family. The head of the family is a lawyer Nikolai Demidovich, his wife, Margarita Polikarpovna, is a kindergarten teacher, and their children, Masha, studies in the first form, and Serezha—in the 5th. In the skiing races daddy outskied all the daddies of the city, mummy beat all the mummies, Serezha outraced all the boys and Masha—all first formers. True, she and the other girls only raced half a kilometre. The Suntsov family won the title of "the most sports-minded family in Gorki".

Similar family tournaments were held in other towns of Gorki region as well—in Arzamas, Balakhna, Dzerzhinsk. The winners met and decided to continue their meetings in the summer on stadium grounds, on the Volga river and on hikes.

Ryazan and Gorki are by far not the most sports-minded cities in the Soviet Union. If you want to see a city in which sports and physical fitness activities are especially widespread we advise you to visit one of the country's youngest cities—Severodonetsk in the Donets coal basin. This city which only recently made its appearance on the map is young in both its own age and the age of its population. The average age is 27. Severodonetsk is populated by building workers, miners, chemical plant and engineering workers.

Recently the Central Physical Education Research Institute polled the population of Severodonetsk. It appeared that out of every 100 seventy begin the day with morning exercises, 41 skate, 60 go in for cycling, every other person plays volleyball, basketball or tennis. Every fourth person is a hunting or fishing fan. In short, virtually everyone goes in for some sport.

Take the young electrician Nikolai Derevyanko. He devotes 11 hours a week to sports. His favourite pastime is football. In his family of five, three belong to the Avangard Sports Club.

The older folk are not forgotten in this young town. There are special physical fitness activities for them. People up to 60 can take part. That was the ceiling they originally decided up upon but they had to lift it. Once a pensioner came to enroll and told them he was 82.

"What do you want to go in for?" they asked him

"I liked skating, but now I want to go in for gymnastics and volleyball. The doctor said I could."

In Severodonetsk they have, in addition to the excellent gyms, stadiums, and pools built on state funds, more than 300 simpler sport installations that the young folk have built themselves. More than 100 of them are in courtyards, in residential neighbourhoods. They hold all sorts of tournaments under simplified rules. Everyone takes part, from young to old.

In the countryside facilities for sports are still somewhat worse than in the city. There is a shortage of sport installations, lack of qualified trainers and people who could correctly supervise these activities from the point of view of methods. In the city of Rostov the athletes decided to extend practical assistance to the village. Every coach, every athlete with a Master's rating, took patronage over some collective or state farm sport club and helps them in training and organising sport activities.

This honourable initiative came to the liking of many athletes of the country. City athletes went out to the collective farms of Byelorussia, to the villages in the Siberian taiga and Central Asia, to the mountain villages of Daghestan, they went to hand down pointers and to help the rural athletes get things running, equip sport grounds and stadiums, organise training and competitions. Who knows, perhaps the names of those who today took their first start at some rural sports installation will be known to the whole world tomorrow?

Old Age Retreats

There are some 40 million persons in the Soviet Union who go in for sports and physical fitness activities in an organised way. Add to this number the tens of millions who are drawn into physical fitness activities through morning gymnastics, exercises at the place of employment (virtually every enterprise has a 5–10 minute gymnastic break during the working day). Finally there are millions of people who like to go skiing and hiking, people who do exercises on their own.

No statistics can give us the exact number of persons going in for sports. It is still more difficult to express in concrete figures the influence that sports have on the population. Yet it is felt in all respects–in the fact that people fall sick less often, that they have become more energetic and joyful.

Statistics do show that the Soviet Union has a very high birth rate for economically developed countries—nearly 25 per 1,000 of the population per year. The average life span has increased during the past 6 years from 67 to 70. An important role in this respect is played by sports and physical fitness activities.

There are more than 21,700 persons in the Soviet Union over 100 years of age. In Daghestan alone, a tiny mountain republic in the Russian Federation, there are more people in the 100 and older bracket than in Britain, France, Switzerland, Denmark and Holland taken together. The Russian Federation has nearly three times more centenarians than the United States.

The standard of living is improving from year to year and the time is near when the life span will be still longer. This optimistic view finds growing confirmation in the research that scientists are carrying out. The well-known Soviet economist, B. Urlanis, says that according to the most conservative estimates the average life span in the Soviet Union will increase another 7 years by 1980 and will amount to 77 years. Compare that with pre-revolutionary Russia when the average life span was only 32.

The Soviet Union is advancing steadily along the road it has chosen despite all the calamities and devastating wars that have fallen to its lot. This road is the one to a higher standard of living, the road of technical progress and cultural advancement. Less than two decades will be needed to lay the material and technical foundation for communism in the Soviet Union and to secure the highest standard of living as compared with any capitalist country.

At present the workday in the Soviet Union amounts to 7 hours and in some branches of the national economy—6 hours. By 1970 the entire country will switch over to a 6-hour day. This will make the Soviet Union a country with the shortest working day in the world.

It is easy to see what tremendous significance this will have for the further cultural and physical development of the individual. That will leave more free time for self-education, music, the theatre, poetry and, of course, for sports.

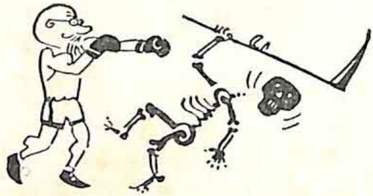
Tens of Millions on the Start

The level of physical fitness and sports in a country is usually gauged by the victories won in international competitions and by athletic results. This gives an idea of the physical development of the younger generation, of its readiness to meet the tests of life.

Not long ago the United States led in nearly all sports. The tables of world and Olympic records were full of American names. The United States fielded brilliant track and field stars, weightlifters, swimmers. Athletes who went down into history are Jessie Owens, the renowned runner; Harold Connolly, the hammer thrower who holds the world record; high jumper, John Thomas; long jumper Ralph Boston; weightlifters Charles Vinci, Tommy Kono, Paul Anderson and many others.

The United States leadership in sports lasted more than half a century. But in 1952 the Soviet athletes took part in the Olympic games for the first time. They equalled the Americans points total in the unofficial team count although they lagged behind in number of medals won.

At the following games in Melbourne the Soviet athletes were more successful. They won 98 medals—37 gold and 29 silver including. The Soviet athletes



ran up a total of 624.5 points–126.5 more than the Americans scored.

In Rome the victory was still more convincing. The count was 43 gold, 29 silver and 31 bronze medals. Although the Americans fought selflessly with maximum tension they only placed second with 34 gold medals, 21 silver and 16 bronze. Their points total was 463.5.

The Olympic Games in Cortino d'Ampezzo and Squaw Valley and later in Innsbruck showed the Soviet Union to be ahead in winter sports.

Now more than half of all the world records belong to the Soviet Union. At world and European championships the Soviet entries won more than half of all first places.

The headway made by Soviet sport is explained by mass participation as well as systematic and properly organised training.

In 1963 Mr. Avery Brundage, president of the International Olympic Committee, was in Moscow as the guest of the Soviet athletes. He said in an interview with the newspaper **Soviet Sport** that the entire world is used to seeing every competition in the Soviet Union yield records. But this is not what glorifies sports in the Soviet Union. It differs from others in the true mass nature of its wonderful system of physical education. This is what the IOC is working for and is trying to implement, Mr. Brundage emphasised.

It is, of course, easier to pick outstanding performers from 1,000 athletes than among 100. And there are still more likelier prospects among millions than among thousands. It is fair to suppose that in any country which does not yet have the conditions for the mass development of sports there are excellent but unknown jumpers and throwers, strongmen, swimmers and football players.

When we speak of mass participation in sports in the Soviet Union we do not only have in mind those who have won glory in the sports arena but mainly the rank and file, the unknown sportsmen.

Readers will probably be astounded to learn that in 1963 there was a country-wide tournament in the Soviet Union which had an over-all entry list of 66 million at all levels. This remarkable tournament was the III USSR Spartakiada, or Peoples Games.

The tournament began at the level of rural and factory PT clubs (there are 187,000 in the country) then it escalated to regional and republic centres and terminated in a gigantic sports festival at the Lenin Stadium in Moscow. 45,000 athletes with Master's and 1st grade ratings qualified for the finals—they won their way through all the lower level tournaments.

There was a computor operating at the finals of the Spartakiada. At the request of journalists it produced some figures which give an idea of the scope of the finals although they have no bearing to the official records. These figures are astounding. Here are some of them.

In the 5 days the weightlifters competed they lifted a total of 236,873.75 kilograms.

The cyclists took part in a distance run of 1,569 kilometres. The number of kilometres covered by all the contestants amounted to 134,934. This is nearly enough to girdle the earth at the equator 3.5 times.

The 92 contestants in the marathon together ran 3,882 kilometres in 233 hours 34 minutes.

We do not speak of the records set at the Spartakiada—there were quite a few. The main achievement was that 10 million newcomers were attracted to sports, more than 9,000 sport clubs were founded. This means more than 100 new stadiums, 90 swimming pools, 4,000 football pitches and 35,000 sport grounds added to the 300,000 sports installations available previously.

Here are some of the statements by the men and women who took part in the sports festival that closed the Spartakiada.

Astana Shlarba from the Abkhasian village of Djgerda: "I am 101 years old. When they told me that I would go to Moscow for the sports festival I was overjoyed. My fellow villagers saw me off and said—ride your horse, Astana, like only you know how. But I am a bit displeased. I have no horse. They told me—march with the others in the column. But I am a horseman. You ask how my health is and I answer—let's dance the lezginka. You ask—have I ever been sick and I ask you—what is sickness? Astana has never been sick. You ask—how to live to be one hundred. My answer is—you must work, be cheerful and ride a horse. Then old age will never catch up with you."

Svetlana Vlasova, Master of sport, world-record holder in parachute jumping: "Today on the day of this festival I made my 1,068 jump. I have had to do all kinds of jumping. I landed in fields, in bodies of water and forests. But today was an unusual landing—at a stadium. How do I feel floating in the sky? Wonderful! I am glad that the first woman to put on a space suit was Valentina Nikolayeva—Tereshkova, who was a parachute jumper like I am. Many girls go in for parachute jumping and many of them want to become astronauts."

Anatoli Krainii, serviceman: "This is my first visit to Moscow and my first time at this stadium. Yesterday when my mates with whom I came turned in I sat up writing letters. I wrote one to my wife, Rita, and daughter, Irinka, in Kiev, another one to the factory I worked before I joined the army and a third letter to my unit. The boys in our unit are all tall, strong, and quick on the go. All of us go in for sports. I like volleyball best of all. I have a 2nd grade rating in this sport. I also go in for gymnastics and track and field."

Volodya Chernov, schoolboy: "When they told us at Young Pioneers Camp that we would perform here we were all jubilant. Of course, I've been at the stadium many a time to see the football games. Now I'm here with my friends from the "Vostok" camp. We're going to take part in the parade here. I want to become a spaceman. I do exercises every morning and I train at the sport centre. I try to study well. I know that a spaceman must be well educated. He's got to have a strong will and he's got to be able to take it."

Talented Individuals? No. A Gifted Group!

Sport achievements are of no value whatsoever if they are only within the reach of one or two and the remainder cannot even dream of coming close to the victors' stand.

Just imagine what would happen if there suddenly appeared one phenomenal athlete in each sport who despite all the laws of nature would break all the records. One would, say, run 100 metres in 8 seconds, another would lift a bar weighing 300 kilograms and a third would swim 100 metres in 30 seconds. Nothing good would come of this. Their rivals would lose all interest in competing and the Olympics and world championships would lose all their emotional impact. There would be no motive power in sports, in fact, there would be no sports left.

No matter how high the achievements of an athlete might be, another one, still stronger comes to take his place. The rivals step on the heels of the champion—this is the thrill of competition. That was the case with the great runner Paavo Nurmi, to whom a monument was put up in his lifetime. Nurmi's glory was then eclipsed by Emil Zatopek, then Vladimir Kutz and Pyotr Bolotnikov. The same happened to a whole string of talented American high and long jumpers who had to relinquish the laurels to Valeri Brumel and Igor Ter-Ovanesyan. That was the case with the world's strongest weightlifter, Paul Anderson, who was replaced by a still stronger strongman, Yuri Vlasov. And now Valeri Brumel whose records are called phenomenal does not doubt in the least that another athlete will come (no one knows his name yet) and beat him. This will happen, without doubt, for life moves forward. Sport, too, does not stand still.

The basis on which the lofty achievements of Soviet sport are founded are mass participation, general accessibility to all the people. Monopolies of individuals are already being lost in such events as speed skating, gymnastics and swimming. In other words, there must be in each sport a group of strong athletes of international calibre who can replace one another at any moment. We feel that such a system will pay heavy dividends and will jack up achievements in the next few years already. The time is gone when it was possible to win by relying on one or two crack athletes only.

In Innsbruck the Soviet Union won a record number of medals: 25 all in all. 11 were gold, 8—silver and 6—bronze. The Austrian newspaper **Die Presse** looked for an explanation of the Soviet Olympic success and noted that the Soviet Union sent a strong, tightly cemented team. It emphasised that the team included 74 athletes from 20 cities, that they all trained and performed as a closely-knit team, helped one another with advice and everyone backed the other man.

Mass participation includes such a typical trait of development of Soviet sport as its multinational make-up. The best athletes take part in international meetings. Every republic maintains independent sport ties with various countries. These ties take the form of regular meetings and account for no less than 50% of country's sport schedule.

Take the Trans-caucasus, for instance. In pre-revolutionary times there were only folk games there. Now the Trans-caucasian republics hold a leading place in Europe and Asia in development of mass sports. Georgia holds tournaments in 20 sports. During the past 3 years Georgian athletes held 178 international meetings with athletes from 36 countries. Armenia and Azerbaijan maintain regular sport contacts with Iran, the Lebanon and Syria in weightlifting, wrestling and volleyball.

The picture is the same with every republic of the Soviet Union. Kazakhstan sportsmen meet wrestlers, track and field athletes from Mongolia. A warm welcome is always given in Uzbekistan, Turkmenia and Kirghizia to athletes from India, Afghanistan, Iran and other countries.

3

Key to the magic box

How Science Helps Sports

Try to imagine the following. An athlete sets up a world record. The entire world gets to know about it immediately. Everyone hears of the trainer who handed down all the know-how and experience to his pupil. Not always can he be noticed as he stands, all pins and needles, on the edge of the lane or at the edge of the pool or platform where the bar and bells have just been dropped with a bang.

The trainer is the co-author of the record. Everyone knows that. The athlete is indebted to him. Strictly speaking he is not the only person the athlete is indebted to. He is also indebted to persons the public never sees and whose names are never mentioned in the sport pages.

There is a scientist standing at the cradle of the modern sport record. At times it might seem that his research has nothing to do with sports, yet without this research there would be no achievement and no record.

How does science help sports?

In the last century when the peoples of Russia were backward and poverty-stricken sport was accessible to the well-to-do only—to sons of factory owners, landlords and aristocrats. But even they had a very vague idea of sports. Sports to them meant a pastime such as dominoes, stamp collecting, keeping pets and even embroidering. Later the word sport came to be applied only to games and exercises that built health and strength. Still later the element of competition and personal contact was brought into the term. And after that sports became what they are at present.

Naturally, in the conditions that obtained in tsarist Russia there could be no special scientific work and research in the sphere of sports. Nevertheless, discoveries were made in the laboratories and studies of scientists that later affected the development of sport and physical education here and the world over.

First of all there were the great Russian physiologists Ivan Sechenov and Ivan Pavlov, the prominent scientist and pedagogue, Pyotr Lesgaft, as well as their pupils and followers.

No one, perhaps, can appreciate the significance of physical fitness as much as those whose work makes them delve into the secret of life and disclose the laws governing the vital functions of organisms. The work of the great Russian physiologists Sechenov and Pavlov as well as of their followers formed the basis of the entire system of physical education in the Soviet Union. Their theories checked by scientific experiments have enriched the practice of physical education and have played an important role in improving the health of the population and developing physical fitness and sports in the country.

Sechenov made a study of the muscular activities of man in 1903. His attention was caught by an important thing–active rest, that is, rest in movement, is better than passive rest.

He carried out the following experiment. He sat at a specially designed device and with rhythmic motions of the right hand, resembling those involved in sawing wood, he raised and lowered a weight. He kept this up for 4 hours. In this period the scientist's hand made 4,800 movements. The weight sank lower and lower–fatigue was setting in. The scientist felt tired and changed his hand. He then began doing the same motions with his left hand.

"When I first began this experiment," Sechenov wrote, "I was very much surprised to find that my left hand worked much stronger than my right hand did. My surprise increased still further when it appeared that the work done by the tired right hand after the work of the left became much stronger than after the first period of rest."

In other words the right hand was resting while the left was working, even better than if both hands had not been working but resting these several minutes.

This experiment and the conclusions drawn by the scientist found practical application. Resting by moving and by rotating occupation are very popular in the Soviet Union.

More than ten million workers take part in the exercise breaks while on the job. Millions of Soviet people spend their holiday on hikes and travelling. They make sports a hobby. Hiking and sports are held to be the best forms of active rest in the Soviet Union.

Pavlov paid much attention to physical exercises. The great physiologist said that sports and in general any muscular activity brought muscular joy. "All my life," the scientist wrote Donets mine workers, "I have always loved mental labour and physical, with preference, I'd say, for the latter."

Pavlov sought confirmation of his scientific theoretical conclusions in sport. He established what laws regulate the work of the organism and found that load should not be increased at once. He checked it sufficiently well during his cycling tours. He paid attention to the fact that one tires less if the distance covered is increased gradually. At first Pavlov covered $1^1/_2$–2 kilometres a day, then, increasing the distance, stretched it to 17 a day. Pavlov applied the same increase in load to riding speed. He explained it this way: "Muscular work is involved. Who knows how many new processes must begin—new breathing, new heart beat, new secretion and so on. Time is needed for the new pattern..."

All of man's activities, all his movements, are controlled by the nervous system. It is not enough to have a good heart and lungs to ski untiringly, to skate fast, to go in for track and field and weightlifting. The activities of these organs must be well regulated by the nervous system, in particular by its highest section—the cerebral hemispheres of the brain.

Just imagine that the dispatcher service of a railway works erratically. All traffic would be disrupted. The nervous system regulates the activities of the organism the same way the dispatcher regulates the work of a railway hub. The greater the load on the athlete during competition, the better the central nervous system must regulate the work of the heart, lungs and muscles and the healthier it must be.

By means of numerous experiments with animals Pavlov discovered the connection between the organism and its environment. One form of tie is the conditioned reflex, these are temporary ties of the nervous system that constantly appear, strengthen and disappear. According to Pavlov's theory the conditioned reflex is the basis of all of man's higher nervous activity. The more a man goes in for diverse physical exercises the better his nervous system functions.

Pavlov's theory has made it possible to solve practically many questions pertaining to athletic training and competition, hardening the organism, methods of training, etc. Pavlov's teachings which have been furthered by his followers have helped to delve into inner secrets of the human organism, to ascertain how the nervous system, the muscles, heart, lungs operate in a state of rest and great physical load. Scientists have prompted better ways of strengthening health and achieving high results in sports.

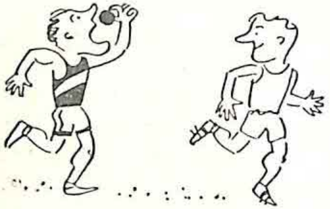
A scientific study of physical education is being carried on in the Soviet Union by two major research institutes in Moscow and Leningrad. In addition to these special institutions scientific work and training of qualified specialists in the sphere of physical education is done in 68 higher schools which annually graduate more than 30,000 researchers, trainers and PT teachers. It should be noted that the science of health and longevity does not exist isolated from other sciences in the Soviet Union. All the achievements of medicine, personal and labour hygiene, urban construction and, of course, physical fitness and sports, are widely used to build up the health of the population and to prolong their life span.

The Magic Pill and Professor Hill

As soon as man started going in for sports he was gripped by the urge to win. This is natural. Sports are inconceivable without competition and a will to win. In this connection not only sci-fi writers but even scientists began proposing wonderful means that would in their view make a man unusually strong, fast, skilful and give him stamina.

Some 15 years ago two Soviet writers published a fantastic novel under the title **The Rocket Man.** It is about a young man who invented a magic pill that kills fatigue. Before taking the start one pill is enough to guarantee victory over the fastest runner. Despite the gripping plot the book was not a success. We shall explain why lower.

In another fantastic novel the author dreamed of the time man would conquer the forces of gravity. The athlete overcomes gravity and runs at unpre-



cedented speed, he makes "cosmic" jumps and lifts colossal weights. All this is fantasy. Yet here is an item that is scientifically substantiated and backed by proof.

The British physiologist and Nobel prize winner Professor Archibald Hill called attention to the possibility of taking advantage of a peculiar biological feature of the organism to improve athletic performance. It is enough to raise the temperature of the muscles some 2 degrees by a special medicine to increase the speed of contraction by 20%. Consequently, concludes the physiologist, the world record holder will be able to cover 100 metres not in 10 seconds, but in 8. Of course, this is an enticing prospect. But then the question arises: what for? Even if we allow that man's muscles and ligaments could stand this colossal strain it is still doubtful that this will do the athlete or sports any good.

The fun of sports and its attraction lie in the fact that the athlete is indebted for his success to his strength, his abilities and industriousness exclusively. No tricks or doping are tolerated by true sports. That is why the Soviet younger generation rejected **The Rocket Man.** And that is why Professor Archibald Hill's sensational discovery will hardly be used in sports.

Science provides the athletes with means no less

astounding and effective than the magic pills or Professor Hill's potion.

Scientific discoveries and experience show athletes the short cut to success. Here is how Soviet scientists recently helped athletes avoid a serious blunder.

Action for Strength

In the West the so-called isometric method of training has recently become widespread. In essence it substitutes static tension for the ordinary dynamic loads. The athlete fixes individual positions while in an immobile state—he holds a bar in a semi-crouching position, chest high or on outstretched hands, he assumes a position of standing equilibrium, etc. The followers of this method claim that it increases muscle and heightens the working ability of the organism. The isometric method is being boosted in particular in the United States by Bob Hofman, well-known manager and manufacturer of sporting goods. He considers this to be a universal method of developing strength. A number of trainers in the Soviet Union also leaned towards this innovation. However, it was up to the scientists to say their decisive word.

The new training method was thoroughly tested in Moscow, Leningrad and Kiev and a number of experiments were carried out. The results led scientists to the conclusion that this method did not justify itself. It was proved that when the organism is in a state of static tension the nutritive and oxygen supply to the muscle worsens. What is more, circulation of the blood and breathing are less intensive than under the dynamic method of training.

Soviet athletes, and weightlifters for one, took the scientists' advice. They did not abandon the tried and tested method of dynamic training with its broad variety and number of exercises. As a result, the Soviet weightlifters won team first place and set a number of world records at the World Championships in Budapest in 1962 and Stockholm in 1963. The American lifters who had up to then won renown for their victories suffered a setback. In 1962 they placed third and in 1963–fourth.

What's the Secret?

Theoretical estimates say that from 15 to 40% of the human energy remain as an unutilised reserve. This energy lies waiting like in a bank. The athlete tries to take as much out of it as possible so as to advance at least one step. Even half a step will do.

How is the treasure hidden in the bank to be extracted from there? Athletes, trainers, scientists in various spheres and engineers have been tackling the problem more than one decade.

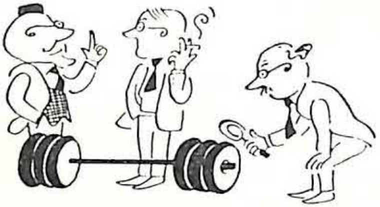
Readers are undoubtedly interested in knowing how Soviet athletes train. What do they consider the main and decisive elements of training to be?

What is the system of training elaborated by Soviet scientists and trainers? At one time it was thought that a runner wins thanks to fast legs only, and that throwers and weightlifters win thanks to strong hands. Now this view is held to be too narrow. In all sports the concerted work of all muscles and organs is needed.

The athlete is helped by a combination of special exercises and general physical fitness. It must be said that general physical fitness is a major part of all training and accounts for more than half the athlete's training time. The significance of physical fitness in achieving top results is shown by the following experiment recently carried out by the Leningrad Physical Culture Research Institute. In order to determine what method of training is better scientists control-checked two groups of athletes. One group only did exercises that developed speed. The other went in for a complex that develops strength, speed and endurance. Here are the results: in the first group stamina and strength mounted 10%, speed—15%. In the second group stamina mounted 35%, strength—30% and speed—40%.

Foremost Soviet athletes try to use as wide a variety of exercises as possible and to go in for more than just their particular sport. Many readers will probably be surprised to learn that Valeri Brumel, who holds the world high jump record, spends much time weightlifting. He also goes in for gymnastics, acrobatics and ball games to attain better coordination of movement. Recently Brumel competed in a new sphere. He appeared at a USSR multiple, 6-event track and field tournament. He ran 100 metres in 10.8 sec., he long jumped 7 m 27 cm, put the shot 14 m 61 cm and high jumped 2 m 20 cm. He did the 110-metre hurdles in 16.2 sec. and 3 m 90 cm in the pole vault. Each of these results in itself was rather high. And together they earned him over-all first place.

The main thing in training is to utilise all means in the arsenal of sports. Another feature in the Soviet training system is high load. Only recently it was believed that in order to increase the mass of muscle it is necessary to do exercises with light and medium



weights to complete exhaustion. It was thought that this was the best way of developing strength. However, under the influence of research studies this view had to be revised. Scientists proved that in order to develop strength it is better to reduce the number of exercises but to increase the weight carried. Weightlifters, for instance, were advised to train all year round. Doctor Arkadii Vorobiev, prominent Soviet weightlifter, who holds a degree in medicine, claims that top results are inconceivable without all-year-round training. Athletes now train 2–3 times a week, 4–5 hours each training session. The road to world records lies through high loads, maximum in volume and intensity, he states.

That is why even weightlifters in the featherweight division lift 7–8 tons per training session. Yuri Vlasov lifts 20 tons each session.

But this does not mean that the greater the weight a lifter raises during training the better. There is a doctor and a trainer keeping watch over the athlete's health. They carefully calculate and dose out the load to avoid over-exertion.

The use of high physical loads made it necessary to carry out further research. As a result the science dealing with the human organism was enriched with interesting discoveries.

In studying the influence on the organism of moderate and periodically large loads, researchers at the

Chair of Functional Anatomy of the Kiev Institute of Physical Culture found that under the influence of exercises the muscles increase not only by means of thickening the fibre but by growing in number. Part of the muscle fibre splits lengthwise. At the same time there is a heightening in their contracting ability. This discovery helped trainers and athletes to dose loads correctly.

Heightened loads are not only used by weightlifters in training but by other athletes such as track and field performers, gymnasts, skiers, skaters.

Be a Fan—It's Good for You

The research and discoveries made by scientists help athletes know themselves better and disclose the hidden potentialities of their organism. But the work done by scientists is not only of interest to athletes but to ordinary fans as well.

For several years now Soviet scientists have been studying how emotion in sports affects the mood and health of the onlookers. An interesting fact came to light: it is not only beneficial to go in for sports but to sit in the stands of the stadium or water arena watching an interesting game or contest and cheering your favourite team.

Emotions of victory, success, jubilation are aroused and this is enough to create a good mood.

Readers might object saying that emotions belong to the sphere of psychology. That is true—in this particular instance physiology is closely intertwined with psychology. When emotions appear in a person it means that physiological processes are in progress in his organism. Research has shown that during the culminating moments of the contest adrenalin is produced at top speed in the organism. This chemical substance can rightfully be called the hormone of cheerfulness. It beneficially affects man's vital functions—it expands the vessels, quickens blood circulation and improves the nervous system. The organism might be said to renovate under its influence.

It is known that for full rest the sectors of the cortex that have been working intensively must be switched off and other centres connected with other activities must, on the other hand, be excited.

There is such a thing as a motor memory. Figuratively, the muscles and the nervous system remember the movements that the person once made. If the fan in the stands watches runners it excites those sectors in his cortex that govern athletes' movements.

Just recall how certain fans behave during the tensest moments of a sport contest. Their bodies bend in the same direction the jumper is moving as though helping him to jump farther. This is done involuntarily and the stronger the seat of excitement in the fan's brain, the stronger this movement. It does not follow from all this, however, that the emotions are not raging in the brain of the man who sits absolutely calm watching a football match. Recollections also awaken in him and ties are restored between the nervous cells that had been sleeping until then.

Physics and Sports

We have mentioned how the physiologists helped sports. But there are other sciences without which the development of modern sports is inconceivable. Physics is first in the list. No matter what sport you take you are bound to run up against questions of mechanics, hydro-and-aero-dynamics. Without them it is impossible to know the laws governing man's movement.

The physicists came to the aid of the athletes to help them to delve into the secrets of training. In recent years a special sphere studying all of man's motive functions–biomechanics–has been developed.

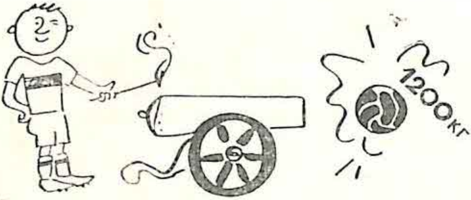
Many precision instruments were made to carry out research. This helps to plan training correctly and to find short-cuts to victory.

Even the most skilled trainer will not always be able to put his finger on the mistake of his pupil. In order to spot it it is necessary to check every step of the runner, every movement of the thrower, swimmer, weightlifter. To achieve this end modern film-shooting methods are used as well as various instruments, including electronic, to give a microscopic view of not only the outer, visible phase of the movements, but also the inner changes in the athlete's organism.

The jumper tries to clear the bar but it falls to earth. Why? Take the runner who comes in last. What kept him back, where did he lose those valuable seconds? These are questions which the scientists must answer. And they are helped by sophisticated precision instruments.

The athlete who goes in for walking is given special "contact" shoes to wear. If his steps are correct the sound of the buzzer is heard. An electronic eye keeps close and constant watch over the movements of the gymnasts. It helps the gymnast orientate himself in space and better feel the position of his own body.

There is no need to go into the details of this

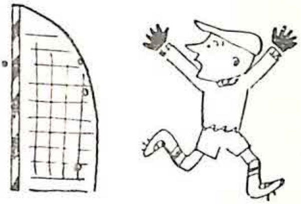


research which would be of interest to the specialists. Here are just a few examples of general interest.

What force does a sprinter put into his kick-off from the starting blocks on the track? What force does a long jumper need to exert in taking off? How much does a boxer's punch weigh? Or the kick of a footballer? What is the speed of a football or tennis ball? These questions are not asked out of idle curiosity. These points are very important for athletes and trainers. They are of practical significance. The famous Soviet mountain climber, Vitali Abalakov, Merited Master of Sports, helped to answer these questions. He is not only an athlete but a researcher and gifted inventor. Abalakov made many instruments which help to get the most exact answers to the questions of interest to his scientific colleagues and his athletic friends.

A strike dynamometre has helped to ascertain that in the long jump the athlete pushes off from the plank buried in the ground with a colossal force of up to 700 kilograms. In order to deliver such a powerful push "steel" legs are needed. Consequently, it is necessary to strengthen the corresponding joints, muscles and ligaments, to train as much as possible.

Abalakov's instruments have made it possible to measure the power of the punch of a heavyweight boxer. It reaches 500 kilograms. And the foot a footballer strikes the ball with a force of up to 1,200 kilo-



grams when delivering a cannon-ball kick. A special film showed that the boot of the player digs halfway into the tightly pumped ball. What is the speed of the ball itself? Ordinarily it does not exceed 50 kilometres per hour, but with a cannon-ball kick it reaches 85 kilometres. The velocity of a tennis ball is much higher—135 kilometres and with players of top calibre it reaches 200 kilometres an hour.

Silver Track

The computations of the physicists are of practical interest to athletes in many fields including ice-skaters. But before going into detail, a word about the history of ice skating in Russia.

The historians tell us that Russia already knew ice skating in the 13th century. Skates were made of bone or wood. And in Siberia there are indications of still earlier skating on sharpened walrus tusks. In the days of Peter the Great, ice skating was very popular on the Neva river and on the icebound ponds and canals. True, skates in those days were nothing like ours. They resembled a tiny boat with a curved iron runner that ended in the figure of a horsehead. That explains the origin of the Russian name for skates (kon'ki=skates; kon'=horse).

In the 18th century iron skates made their appearance. They were clumsy looking things with short, thick and highly bent runners. Still they were better

than the bone or wooden skates. All skaters the world over used them until the Panshin model made its appearance.

Once in the autumn of 1883 a husky, well-built man entered a surgical instruments shop in St. Petersburg and asked the owner: "Can you make me a pair of skates according to this sketch?"

The instrument maker took the sketch and shook his head.

"No one has ever skated on such things before and I don't think there are any such skates anywhere."

"That is why I came," the caller said and introduced himself.

This was Alexander Panshin, a book-keeper at the Nikolayev Railway. His name was rather well-known in St. Petersburg. He skated at the Yusupov park where he showed great ability in speed skating.

Soon Alexander Panshin won a world-wide reputation. He won his greatest victory in 1889 in Amsterdam at the tournament of leading speed skaters. He won two events out of three beating foremost European and American speed skaters.

Panshin was not only a leading athlete, he was a talented inventor as well. He knew physics well and this helped him in sports.

The skates he invented with long sharp blades were called "Panshin" or "Russian" skates and became widespread in many countries. The modern racing skates which the athletes use today to develop speed are somewhat modified and improved models of "Panshin" skates.

When the beginner goes out on the ice the first time he has a myriad of questions: What makes the ice slippery? Why is it that during a thaw and a very strong frost the skates slide worse than in a low frost? Why is that the faster you skate the more confident you feel on skates?

Let us take these questions in turn.

When ancient man first tied sharpened animal bones to his feet and began to slide on the ice he did not bother himself with thinking about where the speed came from when he skated and why skates slide in general. He simply took advantage of what experience had taught him.

The usual answer is—skates slide because the ice is slippery—that is supposed to settle it. But why is it slippery? Because it is smooth. But glass is also smooth. Yet try and skate on a glass rink. Your skates won't budge. What is the explanation?

When the blade of the skate leaves a thin silver track behind as it glides over the ice a thin film of water forms between the surface of the ice and the steel blade. It is thinner than cigarette paper and almost invisible. Yet without it there would be no sliding. It's the same as a lubricant on rubbing parts of a lathe easing its operation. This film is what the skater slides on.

This explains where the sliding comes from. But how does the water get there under the skate?

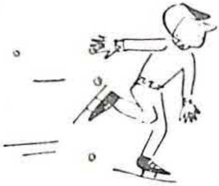
Many years ago the British physicist Reynolds elaborated his theory of sliding. He explained it as follows: the skate presses on the ice, this pressure lowers the melting point of ice and a layer of water appears which causes sliding.

It seems very simple at first glance, but actually things are much more complicated.

It is true that ice begins to melt under high pressure—mechanical energy is transformed into heat. But melting takes place only if this pressure on the ice is continued for a lengthy period. Yet the skater does not stand still—he moves quickly over the rink. His speed in no way affects the quality of sliding. Can enough heat be formed in such an insignificant fraction of a second in which the blade of the skate comes into contact with the ice at any one point? Of course, not. Then there must be another explanation.

Professor B. V. Deryagin, Corresponding Member of the USSR Academy of Sciences, elaborated a substantiated theory of sliding. It boils down to this: the heat needed to form the film of water on the ice is engendered by the same force that the skater tries to overcome—friction. It is interesting to note that the Russian word for friction (trenie) was introduced into science by M. V. Lomonosov.

Friction—and ice! It would seem the two are incompatible. Ice is usually smooth. Yet no matter how mirror-like smooth it might seem there are tiny bumps and dents on its surface. This unevenness causes the friction. At the moment the blade of the skate moves across the ice the mechanical energy of friction is converted into heat energy. The heat



appears at all the points of contact of the blade and the ice simultaneously. This is enough for the ice to melt somewhat and form a lubricant of water. No matter how fast the skater races his skate will always slide.

In order to determine the quality of the ice an instrument was made consisting of a tiny catapult which pushes a miniature ice-boat on to the ice. The better the sliding quality the farther the tiny ice-boat travels. A special table then determines the coefficient of friction.

It was found that the best sliding takes place at a temperature from −4 to −8 degrees. These temperatures are the most favourable for the appearance of a film of water under the blade of the skate. If the temperature drops to minus ten the coefficient of friction mounts roughly by 0.003–0.004. It would seem that this is a negligent figure. Yet it is of tremendous importance for the speed skater. His result for 500 metres might be roughly 1.7 seconds slower.

Secret of Japanese Serve

In 1963 at the world volleyball championship in Moscow the men's title was won by the Soviet team. The women's crown was merited by the Japanese team.

This was the first time that the Japanese girls brought the gold medals home in this sport. It must be said that the Soviet players were very much disheartened by their failure. They congratulated the winners and asked themselves: what was the winners' secret of success? The Japanese team showed good team-work and played with great uplift. They had terrific will to win. But there was another circumstance that could not but help them. The attention of the athletes and numerous fans who packed the Sports Palace to watch this interesting tournament was attracted by the following feature: 14 times in four games the Japanese team won a point on their serve.

This led to the legend of "the secret of the Japanese isles". Everyone talked of the so-called gliding serve and its main executor Esiko Mazumura. When this small and mobile girl held the ball carefully gauging distance and direction before serving it became clear to all—no one would be able to take that serve—it would be a sure point. They were right. There was no telling which way the ball would go—it would suddenly change its trajectory and plummet down where least expected. No one could explain this unpredictable change in direction. The team captain Samae Kasaya was asked about it. She merely shrugged her shoulders and answered with a smile:

"That unpredictable serve was not invented by us. Our trainer found it when studying ancient descriptions of ball games."

This is how this ancient serve, discovered in the annals of hictory, became a miracle-serve in the hands of modern athletes.

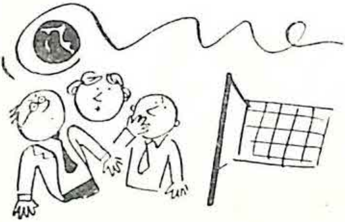
The tournament ended and the players returned home. The secret of the Japanese serve gave the Soviet players no rest. They appealed to the scientists and the latter promised to help.

V. Poznakhirev, a great fan and post-graduate student at the Ukrainian Academy of Sciences, and trainer, V. Lisyanski, conducted a very simple experiment to ascertain the causes of the ball's strange behaviour. They ordered several light balls having the same air valve ordinary volley balls have. In addition they took several balls of the type that were used at the world championship. The researchers sent the balls up into the air tens and hundreds of times. They carefully studied the photographs and films of the balls' flight. They drew diagrams and pored over formulas. Several times they even succeeded in producing the Japanese serve. The ball flew and plummeted down just as effectively as at the world championship tournament in Moscow.

This is what the team discovered: if the ball is made to rotate by a special blow on the side its trajectory bends in the direction the ball is rotating. These "cut" serves of "dry leaves", as the footballers call them, are well known and successfully used in football. But in the Japanese serve the ball does not rotate, it glides.

Another interesting detail was recalled. The Japanese volleyball players, before throwing up the ball and serving, handled it a long time as though trying to find the most suitable position. The serve was made with the wrist or fist held immobile. Why? The answer came absolutely unexpectedly.

One of the explanations of the plummeting ball is the air valve. Its weight is insignificant. Yet it does make one side of the ball slightly heavier. Before throwing the ball up the athlete tries to get the valve into a definite position. By hitting the ball with her immobile wrist she prevents the ball from rotating in flight. Then the law of physics goes into operation which makes velocity dependent on resistance of the air.



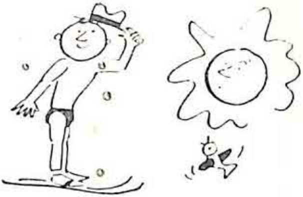
According to the laws of mechanics, the air resistance to the movement of the ball depends on the so-called Reynolds number which is determined by the speed and diameter of the ball and the kinematic viscosity of the air. With a certain lowering of the Reynolds number (it drops with the fall in the speed of the ball) the well-known physical law can be observed—there is a sharp increase in the resistance of the air. As soon as the ball loses speed the resistance of the air mounts sharply and the ball plummets down. All this was expressed in figures, in diagrams and formulas and the theoretical findings were substantiated by experience.

Some time later the volleyball players applied the findings of the scientists—not in laboratory conditions but on the volleyball courts. This is how physics helped them discover the secret of the Japanese serve.

Artificial Snow and Synthetic Skis

And now a few words about another ally of sports—chemistry.

When you are at the stadium, aquatic sports centre or swimming pool take a close look at the things around you. Most of them are products of the chemical industry. You will find synthetic leather,



polyethylene, polychloride, chlorvinyl and many other synthetic materials which no branch of industry can do without today. These materials are also used by man in everyday life.

When you play table tennis, that small celluloid ball that bounces lively off the table is one of the products of the chemical industry.

In archery you pull the string tight. That too is a product of the chemical industry, it is made of nylon or capron threads.

When you go rowing or sailing the hull of your boat is made of plastics. Sail-boats are made of fibreglass at the experimental sport shipyard in Tallinn.

You might be watching a hockey game. The guards that the players wear and their sticks are also made of synthetics—fibres, porolon and other new materials.

Take football. This game is played in all weather. The rain does not interfere with the players—they are used to it. But the ball puffs up and becomes heavier and unsuitable for playing. Now the Leningrad Experimental Sports Goods Factory produces a water-proof film to protect foot balls. With this raincoat on the ball no longer fears the wet weather.

We also meet the chemical industry in skiing and skating.

At the 9th Winter Olympics the Soviet team placed first in number of medals and in number of points in the unofficial count. In skiing, however, Scandinavian athletes won most of the events. The gold medals went to the Swedes, Finns and Norwegians. The experts claim that an important role in their victory was played by the fact that they competed on a new type of skis—synthetic skis. In this case too the chemical industry helped to forge victory.

The almighty chemical industry not only helps athletes fight for speed but also does away with the notion of seasonal sports. If 20 years ago someone told you that people could ski in the summer as well as in the winter you would hardly believe it. But now we invite you to visit Lenin Hills in Moscow or Kavgolovo near Leningrad on any hot summer day and you will see a most fantastic picture. Against the background of the blue sky and bright-green trees you will see clearly defined in the air the figures of ski-jumpers. The snow was machine-made. It's an unusual kind of snow that does not melt in the hot sun.

Actually, everything began with the problem of snow. It is fine for the skiing fans living up North. In the extreme North-East of the Soviet Union there is snow 260 days a year, in Western Siberia—200 days, in the Urals—180, in Vologda—160. It seems that nature intended these places for winter sports. What about those who live on the Black Sea coast or the shores of the Caspian? Some countries too have winters without snow and if there is a snowfall it melts immediately. Britain has to import snow for skiing from Norway. And as on all imported goods duty has to be paid. The British Parliament even debated the possibility of lowering the high import duties on snow.

The problem of snow also interested the scientists, especially those close to sports. In the German Democratic Republic a trainer of the "Motor" Sports Club, Hans Rehner set out to find a substance that would possess all the properties of snow but would not melt. No such substance exists in nature, but perhaps it could be made artificially. The trainer was a frequent guest of the chemists. He could be found in laboratories bent over test tubes.

Finally experiments ended in success. A synthetic substance was found that could fully replace snow. The fibre prepared from it was slippery, resilient and sufficiently durable.

Soon the first ski-jump with artificial surfacing made its appearance in the vicinity of the Oberhof Resort. They spread light mats on the wooden base of the ski-jump. Then they covered them with a metal net and on top of that they fastened brushes made of synthetic fibre like tiles on a roof. The ski-jump was excellent. Jumps measuring up to 70 metres could be made on it.

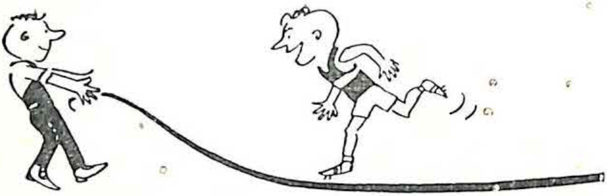
Artificial snow was not only made for the ski-jumpers but for slalom skiers as well. Now they can train and compete all year round in all weather.

Polyethylene Spikes

The highlight of track-and-field are the running events. The chemists set out to help the runners too. The attention of inventors was first of all attracted to the runners' spiked shoes. How could they be made more comfortable, lasting and suitable for all tracks?

Engineers of the "Sport" firm in Kiev succeeded in solving this problem with the aid of chemistry. They made running shoes on polyethylene soles with a set of removable spikes of varying length. In a few minutes' time the athlete can attach any spikes to his sole depending on the state of the track. All he needs is a small, lightweight wrench.

Perhaps running shoes will soon be made without spikes? Running shoes without spikes! There is nothing surprising about that. The spikes are needed to



prevent the sole from sliding while the athlete is running. They ensure a better grip on the track. Even on a good track with a firm springy base the runner loses up to 5 mm every step he makes. One step forward—5 mm back. It would seem to be a trifle. This distance is only one square in a school copy-book. Yet when you run 100 metres the loss totals several dozens of centimetres. In sprinting this is a comparatively big distance. Losing several centimetres might mean losing a race.

It is known to all how runners value a "fast" track. But is it possible to make it still faster so as to run at maximum speed in any weather and so that the soles might not backslide?

It is no easy matter projecting and making an ordinary track. Like a house it has its own foundation —the lower layer made of gravel or crushed brick. Then comes the resilient layer. This is made of slag rolled tight. Next a layer of fibrous peat is put on to absorb water. On hot summer days moisture binds the particles of the upper layer and prevents dust. The upper layer of the track which looks like a homogeneous dark grey mass is actually a mixture of various materials tested and checked in laboratories and on experimental tracks.

The oldest tracks found all over the world are made of cinders.

Now an entirely new type of track is being tested. It is cheaper and more durable than the ordinary

ones. This is a rubberized track made from a smelt of asphalt, sand, and rubber from processed old tyres and waste from the rubber industry. This track does not lose its properties in heat and cold, it is good in any weather. And when it wears down it can be replaced like an automobile tyre by a new one. The top layer of this synthetic track prevents backslide. Consequently running shoes can be made without spikes.

The Fibreglass Pole and Its Forefathers

Every sport has its antecedents. Fencing, shooting and javelin throwing take their start in military art. Skis date back to the first hunters in the North. Hammer throwing in the olden days was a pastime of smithies and ore miners. Hurdling first appeared among shepherds since they had to jump over pasture fences.

What about the pole vault? This popular sport was known in ancient Greece. The warrior armed with a long spear not only used it as a fighting weapon but as a means of overcoming barriers—earthwork and moats, and even fortification walls.

A century ago pole vaulting became a sport. It was an event for the strong and courageous. Much here depends on the daring and skill of the athlete. But that is not all. A good pole is needed for a good jump. Formerly they jumped with a heavy ash pole which was not the best thing that could be used. Athletes were dissatisfied. Of course, how could they like the idea of records kept down to just a bit over 3 metres?

Later the ash pole was replaced by the bamboo pole. This seemed to be the best thing to be hoped for. Jumping techniques were polished, records mounted, the sport spread in popularity, yet athletes were still dissatisfied. The search for higher jumps continued. They thought of how to break the secret of where to get the force for a "cosmic" jump. Experience and observation prompted the answer to this. Professor Nikolai Ozolin, merited trainer of the USSR, tells this interesting incidence from his experience.

"In 1928 my pole cracked. I hunted long in stores of bamboo until I found something suitable. Only it seemed a bit too thin for me. I straightened it over the fire, tightened with the tape banding and began to test it. I found it extremely easy to jump with it. Soon I got used to it and set a new national record—3 metres 80 centimetres. When I began to prepare for the USSR Games they took several photographs of my jumps and showed them to me. I saw that the pole seemed to bend over to the breaking point. I grew frightened. The thing might break and they'd have to start sweeping my bones together! I presented the pole to a friend of mine who was lighter than me and I took a firmer one. I immediately felt the difference. It was difficult to jump."

Consequently the pole must be flexible and resilient. However even the best bamboo pole has its limit of flexibility and resiliency. This limit is measured just as human ability is in sport—by the level of records. It seemed that the record of the American Cornelius Warmerdam—4 m 77 cm was the limit. It held for 15 years and was the last world record set in the pole vault with a bamboo pole. All attempts to pass this bewitched height ended in failure.

But then another American jumper Robert Gutovsky replaced the bamboo pole by one made of duraluminium and then by one of steel. In the contest between wood and metal, metal won out. True, this victory was not very convincing: the record was only improved by 3 centimetres. The new result in the table of world records read 4 metres 80 centimetres. This world record set by Donald Bregg, the last knight of the steel pole, did not last long.

What happened next? It seemed that everything had been tried: ash, bamboo, light and durable duraluminium. What else could nature in alliance with the human intellect and skill offer? The answer came quite unexpectedly: glass. Surprising, isn't it? Everyone knows that the pole must combine lightness, durability, flexibility together with resiliency. Heavy brittle glass would seem to lack these properties completely. Yet almighty chemistry alters the properties of substances remarkably. The boldest fantasy pales before its magic transformations.

Prince Odoevsky, a contemporary of poet Pushkin, wrote: "In 2,500 years people will be wearing clothes made of elastic glass."

Less time passed. Only a bit over century. Man has learnt to make fine and durable threads out of glass, to make fabrics no inferior to silk in softness and elasticity, even durable rust-proof pipes and other technical items. Athletes wondered whether a pole made of glass would be better and stronger than one made of any other material. They made a model and tested it at the stadium. That was it. That is how the era of the glass, or to be more exact the fibreglass pole was ushered in.

In appearance it is an ordinary pole. It is even hard to tell that it is woven of fine glass threads in the form of a pipe whose walls are hardly 2 millimetres thick. This pole is so flexible it can be bent into a giant ring. Yet it is so durable that even several strongmen trying together cannot break it. In a word—this is what the athletes had been dreaming of: a glass catapult!

Those who were fortunate enough last summer to watch the annual US—USSR track-and-field match at Lenin Stadium in Moscow followed the pole vaulters with particular interest. Watching jumps with fibreglass poles is a fascinating spectacle.

The words that best describe the scene are fearlessness and skill. A powerful run-up with the pole poised in hand—and the jumper is air-borne. The pole bends almost into a ring then straightens out like a catapult and throws the athlete up to almost the height of a two-storey house and smoothly carries him over the bar.

What advantage does the fibreglass pole have over the bamboo or metal poles? The explanation is that the height of the jump depends on the height of the grip. When jumping with an ordinary bamboo or metal pole the best jumpers usually grip the pole at a distance of roughly 3 m 90 cm from the ground. And what if the pole is gripped higher? It cannot be done: the pole breaks.

But then the renowned Finnish vaulter, Penti Nikula, took the glass pole. Its reserve of durability is immeasurably higher than that of bamboo or metal. This makes it possible to grip the pole at a height of 4 m 25 cm and it will not break. And so Penti Nikula set his fantastic record of 4 m 94 cm.

Why fantastic? In 1952 a table of fantastic records was drawn up. It was believed that some day super-athletes would emerge who could attempt these records. The one for the pole vault was 4 m 82 cm. Penti Nikula topped it by 12 centimetres but he decided he could do still better. Recently jumping in an indoor arena he cleared 5 metres 10 centimetres.

It seemed that was the limit. But Nikula is not the only one jumping with the fibreglass pole. Strong rivals appeared in various countries. Never before have so many improvements been entered in the table of records as during the past two years. Only recently the Soviet athletes have also taken to these poles. As yet, however, they are only storming national records, not the world records yet.

An outstanding jumper made his appearance in the American continent—John Pennell, 22-year old collegiate athlete, "flying John", as his friends called him. This nick-name was coined only recently. A year ago, John placed 29th in the national table with the mediocre result of 4 m 58 cm. But John knew where the road to success lay and took it to achieve excellent results. First of all, it is essential to a pole-vaulter to get a powerful run-up. Furthermore he trained a lot to develop the strength and flexibility of the acrobat which the vaulter needs so much. In short, he became a versatile athlete and this is important in any sport. Finally the wires brought the news that John Pennell had broken Nikula's record: he cleared 5 metres 20 centimetres with a glass pole.

This record made everyone talk about the ceiling of human potentialities in sport. Someone predicted a ceiling of 5 metres 50 centimetres. Perhaps in order to jump so high the glass pole will have to be replaced by another one, say, a nylon pole. But let us not do any crystal-gazing. Let us paraphrase the saying: "What man can do is limited, what he cannot do as yet is unlimited."

Are All Innovations Good?

Only recently an item appeared in the press saying that poles were being made in the United States out of a special alloy. Specialists claim that the new pole

will make it possible to boost jumps to 6 metres and higher.

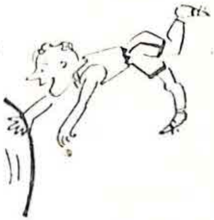
We have our doubts as to whether such things are good for sports. Will not such a daring intrusion of modern technology kill the idea of sport? There are certain grounds for such apprehensions.

What is prized in sports are primarily the athlete's strength, agility and skill. And now the resilience of synthetic materials helps the jumper clear "cosmic" heights. Records are set, not by the athlete, but by chemistry in alliance with physics. What has sports to do with it, you might ask. But you would be mistaken. The appearance of a fibreglass pole engenders new techniques of jumping which will result in a further improvement in this event.

What are the bounds of modern technology's incursion into sport?

There have been quite a few examples of sport officials having to introduce amendments to the rules to ban some particular innovation. They stemmed from the fact that this innovation contradicts the essence and aims of sport. Let us recall what happened to the so-called discus method of throwing the javelin.

Several years ago a Spanish athlete, Felix Erazquín, who did not rank tops in the sport, threw the javelin 83 metres 40 centimetres. This was not



far behind the world record at the time. But it was not this that attracted the attention of the fans, after all there were many cases of unknown athletes attaining outstanding results!

The thing was that Erazquín threw the javelin in an unusual manner. From ancient times there was a popular sport in Spain known as throwing the axle. A cart axle one and a half metres long was thrown with a turnabout of the body as in throwing the discus. The athlete with the longer throw won. This manner of throwing was known as the discus manner. Since the axle resembles a javelin in form, athletes got to thinking whether they oughtn't try to throw the javelin like the discus.

Their success surpassed all expectations. Many javelin throwers followed Erazquín's example and made three turns before throwing. With each turn the speed of rotation mounted. The athlete pirouetted forward until he sent the javelin into the air.

From Spain this discus method moved to other countries. Many predicted that now the javelin can be thrown past the 100-metre mark.

At this point the specialists intervened. No, they said, the javelin must be thrown the former, traditional way. No pirouettes! The thrower must not turn his back for a moment towards the line of throw.

It must be said that in recent years the javelin has been changed in form somewhat. Athletes and trainers have long been studying the trajectory of its flight from the point of view of physics. It appeared that the javelin flies farther if the effort of the thrower is directed strictly along the javelin's axis. But it is not only this that makes it possible to increase the trajectory of the flight.

The distance also depends on the form of the javelin. They made it in the form of a cigar. This aluminium "aerodynamic" javelin made it possible to increase the distance of the throw to about 90 metres. But the officials objected to the aerodynamic javelin and it had to be abandoned.

Here is another example: Not long ago in swimming the breast stroke the athlete swam a large part of the distance underwater. This gave him an advantage in speed. If the swimmer keeps underwater in a strictly horizontal position this lowers the resistance of the water. In addition there are no waves and splashes underwater such as those invariably encountered in surface swimming and which necessitate additional effort on the part of the swimmer.

By taking advantage of the right to dive the Polish swimmer Marek Petrusewicz and the Japanese swimmer Masaru Furukawa set several world records in the breast stroke.

At the 16th Olympic Games in Melbourne Furukawa won a gold medal. Almost simultaneously it was announced that the International Swimming Federation banned all underwater swimming in the breast stroke. After starting the swimmer must immediately surface and swim the entire distance on the surface of the water. In this way the breast stroke was cleared of all alien elements. Now swimmers will have to seek other ways of increasing speed and they have been rather successful, it must be said. An indication of this are the world records recently established by Soviet swimmers in the breast stroke in Baku and London. These records are sizable improvements over previous results.

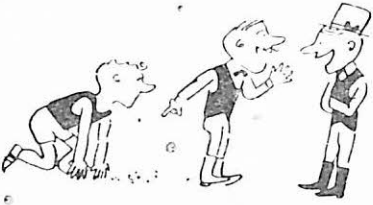
Confirmed by the Olympiad

Every sport contains tremendous, untapped potentialities. Modern sport has been steadily advancing along the road to perfection ever since its emergence. Many new elements are introduced in conformity with the level of science and engineering. Most of the innovations introduced into sports during the last half century at least have been checked and won recognition at the Olympic Games.

The Olympiads bring new records. New stars flare up on the sports horizon to set the pace in sports. What the Olympic Games confirm comes to stay. This not only holds for the rules which may be changed during the Olympics or immediately after them, but also for the changes in tactics and techniques as well as for the appearance of new events.

Let us run through the pages of history. April 1896—the Ist Olympic Games in Athens. The track and field contestants entered the arena of the marble stadium in Athens. We would be surprised to no small measure if we saw the runners of that time. They wore strange togs—long white trousers and black boots. In such clothing one cannot run fast. One athlete stood out among the rest. It was Thomas Burke, USA, he took the start wearing shorts longer than the modern running trunks and light slippers with sharp spikes on the soles.

Ordinarily when taking the start the athletes stood at the starting line erect or slightly bowed. This is how they ran short and long distances in those days. But Burke took a different start. He crouched low and even had one knee and his fingers on the ground.



As soon as the starter's gun sounded he shot ahead like the arrow from a tightly drawn bow.

This low start was not invented by Burke himself. Not long before him another American, Charles Sherill, used it. During a tour of Australia he watched kangaroos jump and noted that before jumping the animal crouches low to the ground. He thought this would be faster.

Thomas Burke finished first in the 100- and 400-metre races. After this all the sprinters recognised the crouching start. This made it possible to save at least 2/10 of a second of the records.

At the II Olympic Games in 1900 the hurdles were of particular interest.

At one time hurdle racing was a sport of shepherds. The shepherds in Britain divided pasture land for their flocks by means of movable barriers. On holidays they usually competed in jumping over these barriers. But when they jumped they bent their legs in the air.

Athletes liked this popular event and they imitated the country boys by trying to jump the way they did.

But then an American athlete, Alvin Crenzlane, took the start at the Olympics. He was the first to realise that jumping this way was irrational–it causes a loss in speed. It is entirely different when you simulate stepping over the hurdle. In this case there is no drop in speed and the hurdler's movement is smooth and fast.

At the Olympic Games in Paris the American athlete demonstrated for the first time the method he had elaborated and won. This is how the modern techniques of clearing the hurdle were born. And the records in this event have steadily gone up.

In ancient Greece the discus was thrown from a stone pedestal. The motions of the discus thrower were immortalised in marble by the great sculptor of ancient times, Myron (The Discobolus). For a long time athletes tried to imitate this marble discus thrower. They would get on the pedestal and assume the same position. Even at the Ist Olympic Games the discus was thrown from a pedestal.

But then the athletes thought of a new way of throwing the discus. The thrower got off the pedestal. This enabled him to make a powerful turn as though charging the discus with the energy of his muscles. The discus flies flat and rotates like a top. According to the laws of physics this rotation gives the discus stability in the air. What is more, the distance of the throw was increased.

Only recently athletes discovered a hidden reserve for increasing the hammer-throwing record. The hammer used in sports weighs 7 kg 257 gr. But the rules do not specify what the hammer is to be made of. The main thing is that its weight and length should conform strictly to the corresponding standard. Ordinarily the hammer was made of bronze but then one of the athletes decided to use wolfram whose specific gravity is greater than that of bronze. Consequently the wolfram hammer will weigh the same as the bronze hammer, yet it will be smaller and there will be less resistance of the air in flight. In addition, the swinging wire can be lengthened to impart a greater initial velocity. This alone makes it possible to throw the wolfram hammer 3 metres farther than the conventional bronze hammer.

It is not yet known whether this innovation will be recognised. This is another example of how technical and scientific knowledge is used in sports.

Not only are the events polished up but the rules as well. It must be said that the rules also contain considerable opportunities lying latent for an improvement in sport achievement. Recently, for instance, the rules for relay running were amended. The runner who takes the baton is allowed an additional 10 metres above the basic 20 to get a running start. Those who take advantage of this rule are ensured an advantage over their rivals.

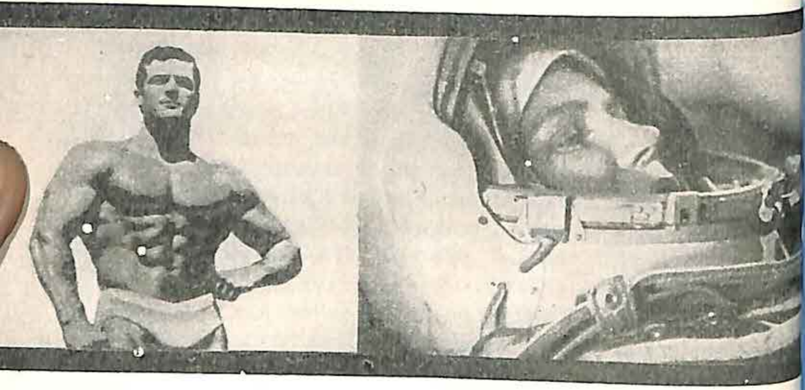
* * *

A few general remarks before closing this chapter. The influence of science on life has become so obvious especially in recent years that hardly anyone will voice any doubts on this score. The practical application of theoretical scientific conclusions can be found in everything from household trifles to manned space ships.

As for sports this is the sphere of human activity where the influence of science seems to be felt least at first glance. Even the examples cited here might seem to be insignificant, to say the least, to a person who has no relation to sports. Indeed, when a ship of a space explorer flies a tremendous distance this is immediately recognised as an achievement of science! And here we deal with mere centimetres and fractions of seconds! Yet science concerns itself with this too and does its utmost to help the athletes gain these fractions.

Fortunately, there are fewer and fewer people who have nothing to do with sports. This is the first objection that might be made to those who recognise the influence of science only when it satisfies their own immediate needs or when it comes on the grander scale of space exploration. Secondly, are there not numerous examples of scientific achievements established in the scientist's laboratory or under the microscope only? Their accumulative effect will make it clear that the overall impact of science on life is tremendous.

Real science, when helping sports, does not free man from the bounds imposed by nature and does not provide him with any fabulous elixirs. It does not interfere in the laws of nature. It tries to understand them and to take everything that nature can give on the background of the normal activity of the organism. It may be that the main secret of any achievement in sport lies in the fact that man does not know his true potentialities as yet. But he will learn them in his quest, in improving himself.



4

People of the future

Miracles without Miracles

What will records be like in 20 or, shall we say, 50 years? In order to answer this question at least approximately we must arm ourselves with knowledge and then lend wings to this knowledge with the help of fantasy.

It is difficult to be a prophet in sports. Life now and then upsets all forecasts no matter how bold they might be.

In 1935 the prominent American trainer, Hamilton, drew up a horoscope of world records in track and field for the distant future. A little over a quarter of a century has passed since then and of the 20 forecasts that Hamilton made of fantastic records only one, the 200-metre record, has not been passed. In short, life upsets forecasts no less boldly than they are made. Naturally, it gets harder and harder as the years go by to save off tenths of a second, to add grams and centimetres to the records, yet athletes valiantly storm the heights and win new victories.

Every time an athlete establishes a new record the question arises: is this the ceiling? Is this the limit of human possibilities? No. No matter how high the records have been in recent years the ceiling has not been reached by far. The prominent German physiologist, Doctor Frucht, used mathematical computations in his book—**The Limits of Human Possibilities in Sports**—to claim that in 8,000 years the record for 100 metres will amount to ... 5 seconds!

We shall not look so far ahead. Let us better see whether the reserves of the human organism endowed by nature are indeed great or not. It is known

that at a moment of strong spiritual shock or some other unusual circumstance an ordinary man can do what you'd never expect him to do in usual circumstances.

The doctors were the first to notice this. In the tropical countries they came across a very strange disease known as amuck. A man affected can run a large distance at a speed of a sprinter. Here is another example: in certain nervous diseases a state known as catatonia sets in. The muscles of the patient become bound so that it is impossible to bend or unbend his hand—even a strongman cannot do it.

It is also known that when hypnotised a man can lie immobile between two chairs with only his head and heels rested on the backs. This is something that even the strongest gymnast would be unable to do. What is more, a grown-up can stand on this live "bridge" and the "bridge" will hold him.

There was a case when a man, not very strong, pulled a steel safe with documents out of a burning building. In ordinary circumstances he would have been unable to budge the safe.

It often happens that a man chased by a dog will jump over a wide ditch. If he could repeat this jump at an athletic tournament a new record would have to be entered in the table.

These incidents taken from life are confirmed by research. Laboratory tests have shown, for instance, that the bones of a healthy young man are unusually

durable. Pressure tests have shown that these bones are 4—5 times stronger than reinforced concrete and when tested for stretching proved to be stronger than oak. The muscle force involved in bending the elbow was measured. It amounted to 40 kilograms. But if the arm is tensed the force is sufficient to pull a quarter of a ton.

Psychological Barriers

A feeling of danger, exceptional circumstances or a burning feeling of duty instantly release forces latent in the organism. But the opposite is also true. There are many cases when a strong and bold man feels lost and is defeated in competition by a weaker rival. They say in such cases—his nerves did not hold.

Sometimes an athlete begins to imagine defeat even before he takes the start. He doubts his own abilities and overestimates those of his opponents. He takes the start with a stony expression on his face, hardly containing his excitement, he sees nobody and notices nothing. We can well imagine the poor showing he will make.

These psychological barriers not only appear because of a fear of one's rival and distrust in one's strength. They are primarily the fear of the heavy weight of a bar, the fear of height (in jumps), of distance, the fear of falling (in ordinary skiing, in the slalom and downhill skiing). Sports toughen a

man's character and help to develop confidence. Much depends in this respect on a correct system of training and on the trainer's skill and ability. Science is also a big aid. This is particularly true of psychology. In order to overcome the jumper's fear of height the trainer brings the upright bars on which the crossbar rests, closer together. This creates the illusion that the height is greater than it really is. The athlete gradually gets used to this seeming increase in height and when the time comes to compete the normally placed bar no longer seems to be so high.

The enemy of all athletes is the dead spot. At the height of competition the athlete is overcome by a feeling of tiredness: he wants to stop, to lie down and rest. This is not so much physical fatigue, since he still has a considerable reserve of energy, as psychological fatigue of the nervous system. By tension of will and self-persuasion the experienced athlete wins over tiredness—he overcomes the dead spot and continues competing with fresh energy.

The athlete only reaches his goal if he succeeds in overcoming the psychological barrier, in developing a feeling of confidence in himself. This is the best medicine, the elixir of victory. The famous Czechoslovak runner, Emil Zatopek, recalls his thoughts before taking the start at the London Olympics in 1948: "The most serious rival was, of course, Heino. They said that he runs much faster than the world record. But if I had stuffed my head with all the

things they said I would have come to the start feeling as though my feet were tied."

Zatopek believed in his strength and won the 10,000-metre race.

Modern world records resemble to a certain extent such psychological barriers as fear of one's rival, shyness of height, weight of the bar, etc. Such is the force of habit and, if you will, self-persuasion.

These barriers will undoubtedly be overcome.

Athletes' Coefficient of Efficiency

We spoke of the magic bank from which the athlete gets his reserve of energy by using the key of knowledge. The more energy he spends on training and competing the more energy he accumulates. However, there is another important thing that should be noted. In order to win it is not enough to mobilise one's latent energies. One must be able to utilise them rationally. It often happens that an athlete expends much energy but still does not win. Why is that?

It has been calculated that the coefficient of efficiency of an average cyclist amounts to roughly 20 per cent. They say that it is not bad–it is double the efficiency of a steam engine and nearly the same as that of an internal combustion engine. Still this is a very low figure. Viewing it from the angle of the future, we see a still vaster sphere of activity unfolding to the scientist and trainer. Perhaps tomorrow they will succeed in finding a better training regimen that will make it possible to put all cells of the organism to work and will make it possible to distribute the athlete's energy more rationally.

The central nervous system contains inexhaustible potentialities. For one, the speed of motor reaction depends on it. The starting time of sprinters, that is, the interval between the signal and the first movement of the athlete, amounts to 0.2—0.3 of a second. This is an insignificant figure but let us visualise what it means to the athlete. In order to save off one-tenth of a second from Owen's world record it took the foremost sprinters of the world 20 whole years.

The time will come when alongside the name of the recordholder we will find the name of the scientist who helps to improve reaction speed and cut the time between the shot of the starter's gun and the beginning of the race by several more fractions of a second.

The further we go the more difficult it becomes to establish records. That is why top precision is required of officials in counting time, measuring distance, weight, etc. Scores of precision instruments have been made to help the officials at athletic tournaments. Still this is not enough. Hardly a tournament goes by without several runners, swimmers, skaters, showing the same time. Who is the winner? We may expect that soon times in the sprints will be measured not only in tenths, but in hundredths of a second. In cycling this is already done. This will give us greater potentialities for registering records.

Champions of the XXI Century

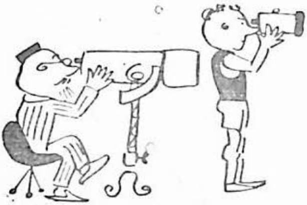
What will future records be like? Prominent athletes express the following opinions. Yevgeni

Grishin, world recordholder in speed skating, believes that soon skaters will do 500 metres, the shortest Olympic distance, in 38 seconds flat and perhaps even less.

Yuri Vlasov, Olympic champion and world recordholder in weightlifting, says: "I think that in the near future today's results in weightlifting will measure up to third grade ratings. The results will be the following: in the heavyweight the press will amount to 200—205 kilograms, the snatch—180 kilograms, the jerk—240 kilograms. The total for the three Olympic lifts will amount to 600—630 kilograms. Don't think that these records are fantastic," Vlasov warns. "This is only the beginning." Yuri Vlasov emphasises that these high results can only be reached by the athlete who possesses an outstanding physical background and a high standard of intellectual development.

This is a very significant remark. It indicates the great importance of man's spiritual development.

Vladimir Dyachkov, who trains Valeri Brumel, claims that in the near future the high jump will reach 2 m 50 cm. It is known how to achieve this result. First of all by increasing the speed of the run-up. Future jumpers will have to run faster than 7 metres a second. In order to utilise this run-up efficiently the athlete will need a more powerful push-off than he has at present. Therefore at training sessions a combination of exercises for strength and speed aimed at developing jumping force will play a more and more important role. Secondly, by improving the techniques of the last few steps of the run-up and push-off. This is particularly true of the initial phases of the push-off when the greatest counter (braking) effort is met. An increase in the initial speed of the jumper's take-off by 0.1 metres per second (at the modern angle of take-off of



63–65°) will help increase the jump by approximately 4.5 centimetres. If the jumper succeeds in adding 0.4 m per second to the speed of take-off his result will increase 20 cm.

Of course, to attain an increase in the absolute result it is important for the jumper to be tall himself. Future world recordholders will be 2 m tall and more. Then the jumper, if he has a powerful push-off, modern jumping techniques and high speed of run-up, can clear 2 m 50 cm.

It must be said that this is a rather modest forecast in comparison to what the scientists predict. They calculated that an athlete 180 cm tall, weighing 75 kg can develop a power sufficient to clear a height of 2 m 80 cm. No matter how high the records of the future will be, one thing is clear—there is no ceiling.

Talents do not appear on barren soil. The necessary conditions must be created for a man's talents to unfold themselves, for all his abilities to be given full play. These conditions have been created in the Soviet Union and have made possible the emergence of many outstanding athletes who have won victory in the world arena.

Any athlete, no matter how high his achievements might be, is not a superman. Noteworthy in this respect are the biographies of our leading athletes. Take Yuri Vlasov and Valeri Brumel for example.

IXX

"I trained with the sole hope for victory," said Vlasov. "My road to success in Rome was not as short and straight as certain people think. I spent seven years training. Those were seven years of persevering, and sometimes very difficult, effort. Yes, for seven years my interests were my work and sports. I rarely had time for anything else. Then there was a string of failures and other worries that followed one another endlessly. The road to victory was not an easy and quick road for me."

Is there any limit to human strength? Probably not, as there is no limit to intellect. Only in time the improvement in results will not be so rapid. Every day will bring people new knowledge about the world around and about us ourselves. Exercises will be improved, especially methods of training, and the secrets of the human organism will gradually be unravelled. For the first time training will be studied scientifically as it should. Sport will become a science embracing a whole complex of knowledge—medicine, chemistry, mechanics, pedagogics with a number of complicated psychological questions. The work of the mind is endless and there are no bounds for the knowledge it uncovers. Human potentialities are unlimited. That applies to physical potentialities as well.

"My life history is the most usual one of a Soviet person," continues Vlasov. "From 1946 to 1953 I studied at the Suvorov Military School in Saratov. I not only acquired special knowledge but got thoroughly acquainted with wrestling, boxing, track-and-field and got to love sports in a big way. Then I studied at the Zhukovsky Airforce Engineering Academy from 1953 to 1959. I did not like weightlifting as a sport. I preferred to read books about it, especially the recollections of famous athletes and strongmen of the past. As for me, I had no intentions at first of going in for weightlifting.

"I often find mention of the word 'secret' in the letters I get. Some writers even accuse me of deliberately concealing secrets that I alone know and demand that I reveal them immediately. I must say that I have no secrets."

Valeri Brumel had about the same to say when he was asked how to explain the high results he showed in jumping. He added: "It's probably a matter of industriousness. Records come from hard work."

Here is what Valeri Brumel has to say about himself:

"The taiga began just a few steps from our house. I was not afraid of it. On the contrary, I constantly tried to get as far as I could to see what there was in the thick of the forest.

"I was not yet 7 when we moved to Yuzhno-Sakhalinsk. I liked the town. In summer I learned to swim and in autumn I went to school. No matter how interesting school might have been I missed the taiga. The biggest pleasure for me were the jaunts in the forest in summer, the hikes with a knapsack over my shoulders and in winter–skiing. Out in the backyard there was a horizontal bar and swinging rings so I did gymnastics very often and picked up a thing or two. Four years passed quickly and again we got ready to move–this time to the Ukraine.

"In the autumn of 1952 I entered the fifth form of a secondary school in Lugansk. I was the first pupil in PT. I was good at climbing exercises and jumped higher than the other boys. When I was 12 I jumped 120 centimetres and a year later I cleared

130. I might have done better but at the end of the school year track-and-field stopped for me. In the summer of 1956 I remained in town and went to the stadium daily. I played football and volleyball with the boys and never missed a game. In the evenings I used to watch the track-and-field athletes train. In the morning when there was no one at the stadium I would jump and repeat what I had seen the grown-up athletes do the day before when training. Once Pyotr Semyonovich Shein, trainer at the Avangard Children's Sport Centre, saw me and invited me to join his group of young athletes. I jumped at the offer.

"I am indebted most of all for my achievements to this thorough-going and solicitous trainer. At first and for a rather long time afterward he made me do everything but polish high jumping techniques. I ran, threw and did gymnastics. Only late in the autumn did we begin studying separate elements of the flip-over jump. That was how my hero—Igor Kashkarov of Moscow—jumped. I was overjoyed when I got hold of the copy of the magazine **Lyogkaya Atletika** (Light Athletics) with a cinegram of Kashkarov's wonderful jump.

"A year later I jumped 175 centimetres. They praised me but Pyotr Semyonovich seemed rather cool. He congratulated me and said. 'You can do much better, and you must.' I recalled these words at the end of February, 1958, when I read in **Sovietsky Sport** (Soviet Sport) that at the US indoor championship John Thomas, a 16-year old schoolboy, jumped much higher than I did. I began to train more intensively and even increased my training time for which I was scolded time and again by Pyotr Semyonovich.

"'Don't hurry,' he told me, 'you can't do everything overnight. In time you too will better.'

"And I did. In the summer I already cleared 195 centimetres.

"I was close to two metres already and I thought I would soon be jumping that high. But Pyotr Semyonovich seemed to be searching for something all the time. He experimented and continued to lay stress on all-round physical fitness.

"'This develops springiness', he would tell me, making me do weightlifting.

"In April, 1959, I cleared two metres. But the summer was unsuccessful for me—I only gained one centimetre. The thing is I did not have much time for sports: there were the school leaving examinations in May and June, and then I had to prepare for college. I took a long time in making my mind up about what college to enter. I went to Kharkov, then Lvov and as a result I was late everywhere. I did not want to return home with such 'achievements' so I took a job at the Lvov Oil and Fats Plant and all my free time, as before, was devoted to sports.

"In spring I moved to Moscow and began training under Merited Master of Sports Vladimir Dyachkov. I began the season by winning a big contest in Tula. Then I injured my right leg and I had to take time out for treatment. During this period I lost the precision I had acquired in run-up and I was struck for long on the level of my results of early spring. I did everything I could to jump higher but my results got no better. I began to lose hope of making the Olympic team. But still I did not despair and trained harder.

"Three high-jumpers were to go to Rome: two of them were known a long time ago—Bolshov and Shavlakadze. There were two candidates for the third place—Khoroshilov from Rostov, and I. A number of qualifying tournaments were arranged for us. Finally, the council of trainers selected me although I was not much better at the time. But two weeks later I set my first USSR and European record—2 m 17 cm. This took place on August 13, which was Physical Culture Day in the Soviet Union, That was when I got the idea of matching strength with John Thomas. I was not daunted by his recent world record of 2 m 22.9 cm.

"Finally my dream came true and I went to Rome. I met John Thomas at one of my training sessions. He was 10 centimetres taller than me and weighed 10 kilograms more. This Negro jumper from the United States was a nice fellow and I liked him very much, but his jumps did not create any staggering impression on me or on Shavlakadze."

In this competition with John Thomas Valeri Brumel improved on the world record several times until he boosted it to 2 m 28 cm. This friendly competition of two of the world's best jumpers struck a record like flint strikes a spark. Brumel and his friends travelled to the United States and the American athletes visited Moscow.

On one of his visits to the United States Valeri Brumel received a Best-Athlete-of-the-Year award for 1963.

In an interview with American correspondents he said he believed that his strongest rival at the Tokyo Olympic would be John Thomas. He added that he hoped to win and to boost the world record to 2 metres 31 centimetres.

John Thomas is not the only rival of Brumel's. Only recently an unusually strong and unexpected rival made his appearance. He is Mahamat Idriss from the Republic of Chad in Africa. At the track-and-field championship in his country he jumped 2 metres 18 centimetres. Prior to that a similar jump was made by Sinswell, Australia.

Beauty—Real and False

When we speak of man's spiritual and physical beauty we not only have in mind his intellect, his broad span of knowledge, not only his physique or skill but also his appearance.

Probably no other notion is so broadly interpreted as human beauty. Different people have different yardsticks. Among the Padwan tribe in Burma a woman is considered beautiful if she has a long neck. Therefore copper rings are put on the girl's neck and the number is increased from year to year. In South America, on the banks of the Amazon, there lives an Indian tribe Chame, which flatten the head of the newborn between two boards. A flattened head among the Chame tribe is considered to be the main attribute of beauty. The people inhabiting Easter Island considered long ears to be the main sign of beauty. In several provinces in Indonesia it is fashionable to paint teeth red, the Siamese blacken their teeth.

The tastes, customs and traditions of every people took shape historically. Yet it often happens in one and the same country among one and the same nationality, that people are found with diametrically opposite esthetic views and notions.

In pre-revolutionary Russia, for instance, the working people—peasants, craftsmen and workers—considered excellent health to be the major attribute of beauty. A broad shouldered young man, a strong, well-built young lady with juicy red cheeks were beautiful in the eyes of the people, but in the eyes of the ruling classes they were coarse. The aristocrats saw beauty in a pathologically pale skin, in a languid wobbly gait.

The cult of the body beautiful which was developed in ancient Greece, in bourgeois society gradually gave way to the cult of clothes-make-the-man. This explained the expensive garments, the silks, velvet, the numerous jewels displayed ostentatiously, as though their possessors were saying: Look how rich and noble we are. You can tell from our appearance that it is not we who work, but that people work for us.

In contemporary bourgeois society the outer attributes of beauty are replaced by the check-book. The check-book covers everything—ugliness of body and soul, hypocrisy and cruelty.

At the same time one often finds statements in the Western press, and the American press in particular: We also glorify strength, beauty and man's physical perfection. Is not the cult of the body, beautiful and strong, developed in the United States?

The striving towards the beautiful is ingrained in the character of every people. It must be said, however, that not always does this striving find realisation. And what should bring people joy often brings them suffering.

People like strength and desperate daring. Good and well. Readers are inundated in a torrent of comics glorifying the cold-bloodedness and inventiveness of murderers. Shots ring out on the screens of the cinema and TV, blood is spilled and men fall dead all around. The heroes of Western films are usually impossibly strong men who overcome inhuman difficulties and despite the cost—reach the happy ending.

This is how the younger generation is inculcated with the ideal of the "strong man" and cruel killer who is ready for any crime to attain his goal. As a result we have a fall in morals, an increase in juvenile delinquency.

We stand for genuine beauty. For the beauty of spirit, body and behaviour. When we speak of the

beauty of the body we not only have outer appearance in mind, not only form and proportion, but the ability to keep it in perfect control. Graceful movement is best displayed in eurythmics and figure skating. Just watch how gracefully and with what ease gymnasts and figure skaters move. True beauty of the human body is not in a static position, as the adherents of the body-building cult claim, but in movement. That is why the best figures belong to people engaging in physical labour, athletes, ballet dancers and circus performers.

The body beautiful is not a goal in itself, but a convincing indication of the human's health and harmonic development. The great Russian writer and democrat, N. G. Chernyshevsky, wrote that the beautiful in man is inconceivable without an understanding of the harmonic development of the organism and human health.

We should like to deal with certain views on the physical development and beauty of women.

In the first years of Soviet power some scientists claimed that if woman is equal to man in all spheres of labour and public endeavour then in physical appearance she must approach man too, possess well-developed muscles and be physically strong. The majority, however, argued that this conception was a vulgarisation of the very idea of physical

development. A woman must be a woman. She must be feminine to begin with. This view won the upper hand. But it is not only fine body form that is a sign of beauty. What makes a man beautiful is his spirit, his mind and deeds.

A man's outer features are given to him by nature. In this respect it is like a lottery—the lucky man wins. Some are born beautiful, others have very common features and still others are plain ugly. But are man's features not ornamented by his mind, will and kindness? They tell on a man's appearance just as negative traits do—such as cruelty, stupidity and absence of will-power.

When a man engages in labour in society he acquires spiritual uplift. This imparts beauty, charm and attractiveness. We are certain that under communism all people will not only be spiritually beautiful but outwardly beautiful as well. This is not utopia. This will be attained since beauty depends on the conditions in which people live. And conditions under communism will be ideal. All people will have extensive opportunity for engaging in sports, for developing good esthetic taste and for improving their figure. The further human society advances in its development the more people we will have with excellent figures, people who are beautiful in appearance and spiritually.

Why We are Against the "Body-Building" Fad

In many countries the body-building cult has become widespread. This is a system of exercises which is supposed to make a man strong, build up muscle and make a man handsome. Strongman contests are held with the athletes marching out to the strains of music. Their bodies which are anointed with special salves shine in the glare of the floodlights. The athletes pose to demonstrate their muscles. The bigger the biceps the more chances of winning the prize. Before posing for the audience the contestants train for a long time with small weights. Many of them hit their muscles repeatedly with the edge of their palm to make them bulge. This is a painful process. Everything in these contests is geared to sensation and publicity.

These contests like the entire body-building cult that sponsors them are business, nothing more. This is a profitable enterprise that nets millions.

But let us disregard this aspect and view it from the sports angle. It would seem there is nothing bad about young people wanting to be strong, to have beautiful bodies and strong muscles, and to develop them by training hard with weights, dumbbells and expanders.

Actually long monotonous strength-building exercises can only disrupt the harmony of the body, lead to ugly, one-sided development. As a rule the body-builders have an unproportionally developed torso—chest, shoulders and arms. Research has shown, however, that a tremendous chest contains a weak heart and lungs with a small vital capacity. The outer appearance of strength—massiveness and huge biceps—are not at all signs of good health. All this is purely ostentatious, intended for outer effect.

It must be said that the body-builders have found followers in certain socialist countries, especially in Poland, and to some extent in the Soviet Union. While they reject the ugly publicity involved in these contests of male beauty some people believe that there is a rational kernel in body-building. In Poland they even hold "Mr. Universe" contests. Dmitri Ivanov, the well-known Soviet weightlifter, has this to say about one of these contests:

"The contest took place in Warsaw in 1959 following the world weightlifting championship. The sponsors of the contest claimed that never before have such beautiful young men assembled to contest the title of "Mr. Universe". These claims aroused colossal interest in the contest.

...The huge Gvardia arena could not seat even half the number who came to view the male-beauties. Frankly speaking, the weightlifting championship did not even draw such a crowd. The muscle-men followed one another on to the brightly illuminated stage to the music of a jazz band and artistically displayed their muscles. There was applause in the hall, not enthusiastic applause, but condescending, I should say. There was none of the tumultuous hand-clapping or cheering in the traditional Polish fashion when the Warsavians had earlier shouted—one hundred years!-in chorus in this very hall in admiration of the weightlifters' courage, skill and strength.

We felt awkward and even sorry for the American athlete, Tommy Kono. After the stormy applause he merited in the weightlifting tournament, now all he drew from the audience was luke-warm applause as a follower of the body-building cult.

Why did the appearance of the followers of the body-building fad leave the audience virtually unmoved? The reply is self-evident. This posing cannot be as gripping as real athletic competition. It is not so much outer appearance that is valued as real strength, skill and daring. The body-builders only play for outer effect although there are men among them who are gifted as athletes.

Perhaps such contests can be considered to be a review, to some extent, of the achievements of physical culture? Not at all. When people go in for sports their aim is, primarily, to build up health. That is why exercises are selected with a view to developing strength, skill, speed, stamina, to improving the work of internal organs. The fad of body-building does not set these aims. Muscle and beauty contests pursue but one end—firing the audience's imagination. The main thing for the body-builder is to win first prize—all he needs for this is to possess enough bulging muscle.

It is claimed that beauty contests aim at popularising the idea of harmonic development of the body by means of physical training. This idea existed some 2,000 years before the appearance of this fad. But body-building only distorted this idea and narrowed it to the point of ugliness. The body-building cult contains, in its very essence, a vice typical of individualism, that of self-infatuation. This invariably engenders a disrespectful attitude towards other people who do not have big muscles. This cult contains an element of narcissism. Just as in ancient Greece the youth Narcissus fell in love with his reflection in the water, the modern body-builder worships his own body. The only difference between the two is that latter does not look into the water but trains hours in front of the mirror.

The followers of this fad claim that their aim is to improve the human body. Actually they are out to develop muscle, muscle in bulk. Everything is geared to this aim—training, regimen and way of life. For the faddist good posture and grace of movement is of secondary importance. That is why you will never find athletes, gymnasts, swimmers, taking part in these beauty contests. Their place is taken by the strongmen-weightlifters. Apollo, who was formerly held to be the ideal of masculine beauty would be a failure at these contests. He could not compete with the body-builders in thickness of arm or volume of hips. In short, the harmonically developed man is out of place at these contests.

A few words about the refereeing at these beauty contests. Everything depends on the opinion of the panel of judges. There cannot be objective opinion. When it comes to such a matter as human beauty it is astounding how tastes and views may differ. We have already mentioned how differently and originally various nationalities measure beauty. There are no standard criteria and can be none in this sphere. True, most of humanity considers the models of beauty to be Apollo and Venus who were created by the sculptors of ancient Greece. But what is there in common between this heart-warming perfection of form and the ugly, one-sided development of the men who appear at the muscle-man contests? At best the latter might be a personification of strength, but certainly not of man's harmonic development.

In the Soviet Union these beauty contests are not held. The Soviet Union reviews strength, beauty and perfection at mass sports festivals. These reviews take the form of impressive and colourful mass tournaments. The contests here are the contests held on track and field, in swimming pools and football pitches. The very idea of man's all-round physical education rejects the muscle-building fad.

What will Man be Like?

In order to do justice to this question it is necessary to deal in detail with the economic and social conditions attending man's development and to determine what man is like today.

It is one thing when we speak of the highest manifestation of man's physical strength and abilities, of athletic records, and an entirely different matter when we speak of ordinary men and women who are far removed from sports. But can it happen that in time humanity will cleave into two? On one pole there will be the physically strong, the athletes. On the other there will be all the rest—the frail, the sickly—in short, the people who lead a virtually sedentary way of life.

This, by the way, is a point of view adhered to not only by many scientifiction writers, but by many scientists in the West as well. Their line of reasoning is roughly this: our age is the age of highly developed techniques, of mechanisation and automation of production, the age of highly developed transport. Less and less physical effort is required to produce material values. The person whose job is done by a machine has only mental labour open to him. Pressing a button on the control panel does not require much strength. The muscles gradually fall into a state of atrophy and man becomes a pampered being with a huge head and weak body. In other words civilisation will inevitably lead to a weakening and degeneration of the human race.

This is declared by the sceptics who go counter to the facts we have already spoken of. Man today is stronger, more modern than his ancestors were. Consequently, it may be said in all reason that man's further development will not take the road of collapse and degeneration, but the road of progress.

It is not technical progress that leads to an ugly, one-sided development, but the social system under which one group exploits another and lives at their expense. This is the main thing that hinders the development of the personality, that cripples him physically and spiritually. On the contrary, where people are free, where they build their lives as they see fit, their development, both spiritual and physical, attains unprecedented heights.

Marx and Engels, the founders of scientific communism, could not ignore, naturally, such an important phase of human activity as physical education. They convincingly showed that the all-round physical and spiritual development of the individual was only possible in a socialist society where there is no exploitation of man by man. The very essence of large-scale industry implies the all-round development of man. Yet the capitalist organisation of production prevents this. Karl Marx wrote in **Das Kapital** that the capitalist, because of his wolfish selfishness, deprives the worker of the time needed for education, rest and physical education.

Only under communism is the harmonic development of all of man's abilities possible as well as their full application.

V. I. Lenin, the founder of the world's first socialist state, paid great attention to the health of the workers and peasants, to the development of the peoples' talents in all spheres of culture. Lenin pointed out time and again that it is necessary to build a socialist society to ensure the complete prosperity and free, all-round development of all members of society.

Lenin emphasised in a conversation with Klara Zetkin that the young people in particular need cheerfulness and vitality. What is needed, he explained, is healthy sports, gymnastics, swimming, excursions, physical exercises of all kinds, versatility of spiritual interests, education, analysis, research and all together so far as possible! These words of Lenin assume greater significance at present when the Soviet land has attained a high level of economic advancement and technical progress.

We live at a time when machines are really ridding man of heavy manual labour. We are seeing many professions disappear which have been unbearable for millions of people from ancient times. The heavy job of the dockers, for instance, is being shouldered by a whole army of lifting machinery. The job of the reaper and thresher, which has been sung in such mournful tones by the poets, is now being done by harvester combines and other machines, and the work of the plougher is being done by powerful tractors. The automatic production lines at plants and factories have rid numerous people of tiring monotonous operations. But no matter how widespread mechanisation and automation of production processes have become, man will not lose his strength, skill and mobility. These traits will always be needed, now and in the future. In order to control modern, intricate machines, to tap the Arctic and Antarctic, to drain swampland and to irrigate deserts, to turn them into oases, in order to fly supersonic planes and space ships, a maximum tension of spiritual and physical energy is needed together with attentiveness, coordination and speed of movement. All these traits can be developed by sports.

We are used to seeing young people at the stadium and sports ground. The contestants at major tournaments are twently-year olds. If an athlete is 30 he is considered to be "old" and usually takes his place in the stands together with the other fans. He rarely takes part in tournaments. It seems quite natural to us.

We believe that in a future society man will be at the zenith of his strength and health at the age of forty and fifty. People will be going in for sports until they reach a ripe old age. And they will enter competition and show good results. In all probability in time certain events will be selected and the rules changed so as to make them more accessible and useful for people of varying age.

The different events themselves will change. They will become more interesting and dovetail with the level of science and engineering of the future. At the same time much that has been elaborated by the present and past generations will remain and be further developed.

Not only will different sports become widespread, but also various multiple events. Athletes and trainers have long noted that among weightlifters one group of muscles is more developed than others, among runners or throwers—other groups of muscles. But in order to have all of man's muscles developed equally the most diverse exercises from different sports were introduced into the athlete's training. Gymnasts do track and field, swimming, skiing. Track-and-field athletes do gymnastics, swimming, skiing and skating. Skiers do gymnastics, cyclists go skating. Such versatility helps attain high results in the particular sport.

It is not by chance, therefore, that various types of multiple events are gaining in popularity. This is particularly true of the track-and-field decathlon which is called the crown of athletics. There is every reason to suppose that in the future athletes will mainly be decathletes, since multiple events best of all promote the harmonic development of man.

Special complexes of exercises will be elaborated for people employed in various spheres of the national economy with a view to the peculiar features involved. General development exercises will assume increasing significance. In most probability they will be carried out in the form of emotionally packed games. This will make physical exercises more attractive and introduce the element of competition into them and bring them closer to sport.

It is clear that physical perfection cannot be achieved by physical culture alone. This is brought about by the entire complex of living conditions of society.

Some people think that under communism people will only engage in sports at gigantic stadiums or crystal palaces. Of course, there will be such stadiums and palaces for mass tournaments and athletic festivals. However, the main thing is that the people will have at their disposal numerous handsome and convenient sport installations. They will be in every residential block, park and perhaps in every house. Even now in planning new towns, residential neighbourhoods and schools in the Soviet Union much attention is paid to create the best conditions for sports.

Man in a communist society will harmonically combine spiritual wealth, moral purity and physical perfection. The principles on which the upbringing of the Soviet man entering the Communist tomorrow is based are: lofty realisation of public duty, collectivism and fellowship; humane attitude towards and respect for people; man is a friend, comrade and brother to man; honesty, truthfulness, moral purity and modesty, intolerance of injustice, of parasitism, dishonesty, careerism, money-grabbing, intolerance of national and racial discord, fraternal solidarity with the working people of all lands and with all nations.

Sports and Space

There are many wonderful professions in the world. Admiration is commanded by the humane profession of the doctor, the courage and coolness of the spiderman, the wisdom of the scientist, the inspiration of the poet and composer. But the profession which is closest to the ideals of the future is the profession of the cosmonaut. And not because it is surrounded by a halo of romanticism.

The spaceman must be extensively educated and must master several specialities. He is pilot of a space ship. He is an astronomer, a physicist, a medical man and a biologist. You will agree that it is no easy matter for one man to combine so many specialities. But without this space flights would be of sport interest only.

The Soviet cosmonauts have successfully mastered the "cosmic" specialities. Their observations and research have made a most valuable contribution to science—they paved the way for others to the stars. Yet saying of Yuri Gagarin, of Gherman Titov, of any of their colleagues, that they are versatile specialists is saying too little. These are people with broad souls and a great inner culture.

Those who set off for the unexplored expanses of the Universe must take with them will-power, which is a most valuable item, since the loss of self-possession in space may cost the spaceman's life.

Sometimes one hears the following contention: cybernetic machines will come to the rescue—they can do any operation much quicker than man can. However, even the smartest machine cannot foresee all exigencies. Finally, the spaceman must possess exceptional health and stamina. His organism and psychological make-up must adjust themselves to the laws of outer space. This adjustment begins long before the spaceship shoots skyward with a roar and flash of flame. Where and how are the cosmonauts trained?

They live and train in a special village. The day begins with setting up exercises. When watching these young people doing their gymnastic drills in the open air one gets the feeling of watching morning exercises at a summer resort. Only the movements of the young people doing PT here are more energetic and clear-cut than among ordinary people. This is understandable, of course. Outer space is not for the weak.

Yuri Gagarin, liked basketball from early childhood. Gherman Titov was fond of gymnastics and acrobatics, cycling. Pavel Popovich liked football and hockey. At the Winter Olympics in Innsbruck he cheered on the Soviet team and said jokingly:

"If things get tough, I'll help you out of the hole. Consider me to be a reserve player."

Valeri Bykovsky is a good swimmer. In childhood he was the best forward they had in the boys-team of the town of Pavlovo-Posad, near Moscow. The cosmonauts not only do their setting up exercises on the ground. Just recall how astounded the world was when it learnt that Nikolayev and Popovich began their day in outer space with gymnastics. That was one of the major elements in the flight program. Andrian Nikolayev had this to say on the subject at a press conference:

"The ease connected with weightlessness, the absence of the need for any physical exertion, may lead to a drop in muscular tone—and this is highly undesirable when returning to Earth. After complete muscular relaxation the astronaut will have to make tremendous effort to stand up to the strain entailed in re-entering the atmosphere and for safe landing.

Naturally, setting-up exercises in space differ from those on Earth. In conditions of weightlessness it is impossible to run in a space ship, to jump or to make any sharp movements. Consequently, a special complex of physical exercises was drawn up mainly to remove the feeling of fatigue. In the future with flights lasting months and years, gymnastic exercises will be particularly useful to interplanetary travellers. Weightlessness eases the work of the heart. And it might be weakened in conditions of lesser load. Yet it will have to withstand a tremendous strain as soon as the ship begins slowing down and entering the dense layers of the atmosphere. Daily gymnastics will keep the heart from getting lazy during lengthy flights and prevent muscles from going stale.

Scientists, engineers and doctors, working together have devised a number of sophisticated machines and difficult tests to train the astronauts. All this is done to check the strength of the man and his readiness for heroism, to strengthen the muscles and to harden the will. It is also true that once in space the man who has gone through these tests will retain spiritual uplift and ability to work all through the flight.

There is a view that only exceptional people can stand up to such training and space flights, that space flights are beyond the scope of the ordinary man. But are not the astronauts who have won glory for the flights around our planet the most ordinary people? They are the same as many of us—they are merry, kindhearted, and want to know everything.

It is not by chance that alongside the names of the cosmic brothers there stands in the story of how outer space was conquered the name of their cosmic sister, Valentina Nikolayeva-Tereshkova, an ordinary, modest and charming woman. Can anyone claim that she possesses superhuman strength or supernatural health?

The time is not far off when the pioneers of interplanetary travel will be followed into space by people who will make a further study and explore outer space as well as the planets closest to the Earth. These will be physicists, biologists, engineers, doctors. Not only must they be highly qualified specialists, but athletes as well. This is the Sesame to a space flight.

Knowledge and sports are the powerful wings which will carry man into the heights of the Universe. Knowledge makes man's intellect almighty while sports prepare his body and will for the difficult trials ahead.

Yuri Gagarin, spaceman number one, pointed out: "This age is one of great discoveries and stupendous construction undertakings. In order to be worthy of the times, to bring the homeland as much benefit as possible, to build houses and factories, to put up hydroelectric stations, to grow bumper crops, to defend the peaceful endeavour of the people and to fly into outer space, strong muscles are needed, a strong will, character and lofty ethics. Sports promotes the development of all these traits."

Talking it Over with the Reader

AUTHOR: In this book I tried to gauge the limits of human potentialities in sports. I did not set out to give all the answers. I only cited several facts and attempted some conclusions. I suppose not everybody agrees with me—so, let's talk it over.

READER: I think your view of things is too optimistic. If I'm not mistaken the prominent Russian physiologist, Mechnikov, said that man as he appeared on Earth is an abnormal, sick being who should be taken care of by medicine.

AUTHOR: That's true, Mechnikov did say that. But immediately afterward he stated that with the help of science man can rectify the shortcomings in his nature.

READER: Good. We can agree that progress has made modern man physically better than his forefathers. As a matter of fact, this is even flattering. But the thing that has me guessing is—aren't you overestimating the role of physical fitness and sport? It has been proven that the average longevity of an athlete is not higher, or at least not much higher, than of people who have nothing to do with sports. Not so long ago Dr. Rook in Britain came to a very interesting conclusion after making a study of the life span of former Cambridge students. He found that former students who went in for sports lived on the average 67.97 years. The non-athlete lived 67.43 years. The difference is insignificant, as may be seen.

AUTHOR: I do not question the figures mentioned by Doctor Rook. But we shall have to lift the lid of these figures to see what lies under them. Allow me, on my part, to ask you a question: what sports did the students surveyed by the British scientist go in for?

READER: Oh, the ordinary things. Some must have gone in for jumping, running or throwing, others played golf and some, perhaps, went in for weightlifting.

AUTHOR: That means every one of them went in for one or two sports, maximum. Undoubtedly, every sport has its strong points and promotes the development of a certain group of muscles or organs. And what happens with the rest of them, with the organism as a whole? Does it not remind you of a machine in which only a few gears or units function properly? The weak parts go out of commission and then even units that are altogether good will be of no use.

READER: What are you driving at?

AUTHOR: It is necessary to think of improving the entire system of physical education. I said as much in the book. It is not narrow sport specialisation that leads to the harmony of all systems but a complex of exercises aimed at a definite goal: raising an ideally healthy physically perfect man.

READER: And who are we going to take as our model—outstanding athletes? Olympic and world champions and recordholders? But we can't all be Brumels and Vlasovs.

AUTHOR: We don't have to be. Let's get one thing straight: the things one man can do today will be done by many tomorrow. Life provides us with forceful confirmation at every step. When we speak of outstanding athletes or astronauts we speak of them mainly as of pioneers of the future. And they can serve as inspiring examples for our contemporaries.

READER: If I understood you correctly, you admit that every outstanding champion or recordholder is unique in his way. He is raised like a rare plant.

AUTHOR: Not at all. You realise perfectly well that victories in sports are won in struggle. Every champion has behind him years of persevering effort. In the long run the most patient and most persistent win out. But the main thing is still not individual records and not athletic victories. The Soviet Union shows concern for the physical development of the entire population. That is what has made possible the emergence of so many outstanding athletes. It is right to say that there is no limit to man's improvement. The future belongs to man.

READER: If, of course, there is no war!

AUTHOR: Of course, if there is no war. We believe in the intellect of the people and their humaneness, their desire to be better than they are. We believe in the powerful forces that are upholding peace on earth. Mankind now possesses forces that are practically unbounded in scope and might. The development of science will make it possible in the near future to make still more astounding discoveries. There is no doubt that medicine, biology, physiology and other sciences, as well as the latest technical achievements can do miracles in alliance with sports. At present there exist moral norms. With time, and I have not the slightest doubt about it, there will be norms for physical education too. Fully harmonically developed men will not be the exception, but the rule.

АПН